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Notes of the Month

WOOLGROWERS TOO COMPLACENT

THE apathy of many New Zealand woolgrowers who will not recognise that the "winds of change" are sweeping the world textile industry, was attacked by the retiring chairman of the New Zealand Wool Board, H. J. Wardell, in his final address to the Board's electoral committee in Wellington. "They prefer to live complacently in the past and leave it to the Wool Board," he said. "They fail to understand that without their enthusiasm and support, the Board is severely handicapped." High prices for wool during the Korean War did much to stimulate production of competitive fibres, said Mr. Wardell. Everyone knew that these fibres lacked wool's many natural characteristics, but important improvements had been effected by synthetic fibre scientists. Du Pont had now been able to produce a fibre which in many respects was similar to crimpy wool.

Change was taking place in wool's position as an old-established high quality product, enjoying universal acceptance and unrivalled reputation over the years, he said. "These remarks are not made as a gloomy portrayal of wool's future as a textile fibre but if there are problems ahead for our wool, then there are problems ahead for the whole economy of this country, and we must not live in a state of complacency". Woolgrowers' prosperity was threatened not only by the closing gap between rising costs and the ceiling dictated by synthetics. There were other factors reducing demand—extensive heating of buildings, cars and other transport, and electric blankets. Holidays, plane trips, cars and television sets sold increasingly on instalment credit, were all promoted on a scale far outweighing the promotion of textiles in general. They were reducing the demand for clothing—and wool's share in that demand.

Did woolgrowers in general appreciate this "wind of change" and the effect it was having and would continue to have on their product, he asked. Too many woolgrowers were inclined to query the necessity of increased levies for wool promotion. They overlooked the fact that the Wool Commission was accepting half of their commitment, the work and responsibility of the electoral committee of the Board was discounted, and little interest was taken in its election and the important function it performed. "They refuse to accept the position obtaining today in which they are competing with a fibre that is constant in supply and uniform in price, not only during the season but from season to season, and they fail to realise the importance of trying to supply wool to the trade tailor-made just as synthetics do". Many growers had failed to keep abreast with the times and were not prepared to discipline their desires so that the industry could present a united front in meeting competition that would be very much more acute in the future.

MAN-MADE FIBRE STATISTICS

PRODUCTION of man-made fibres in August was, as expected the smallest total for the year, according to figures released by the British Man-made Fibres Federation, but was also the highest August figure ever recorded. The total of filament yarn and staple at 43·18 mn. lbs. compared with 46·65 mn. lbs. in July and 39·66 mn. lbs. in August last year. With a wider adoption of staggered holidays in most of the man-made fibre producing factories, the dip in August production is not as pronounced nowadays as it was a few years ago. Production of filament yarn at 21·45 mn. lbs. compared with 22·00 mn. lbs. in July, and 18·19 mn. lbs. in August last year. Staple production, at 21·73 mn. lbs., compared with 24·65 mn. lbs. in July and 21·47 mn. lbs. in August last year, and contrary to the practice at most factories, one large staple producing unit was mn. lbs., compared with 24·65 mn. lbs. in July and 21·47 mn. lbs. in August last year, and contrary to the practice at most factories, one large staple producing unit was closed for one week's holiday and maintenance. The total production of yarn and staple continues to make a very good showing compared with previous periods, amounting in the first eight months to 395·16 mn. lbs. compared with 353·55 mn. lbs. in the previous eight months, 325·30 mn. lbs. in the first eight months of 1959, and 276·12 mn. lbs. in the first eight months of 1958. With the holiday period over, deliveries of man-made fibre yarn and staple continue to be made at a satisfactory level in most textile areas.

PRODUCTIVE CAPACITY FOR SYNTHETIC FIBRES TO BE INCREASED

COURTAULDS LTD. have decided on a further large increase in capacity for their new acrylic fibre "Courtelle." This will bring total U.K. capacity up to 32,000,000 lbs. per annum and they also announce that the capacity of the "Courtelle" plant in France, due to start operating next year, will be 10,000,000 lbs. per annum. These announcements, following within a year the last decisions to expand production, reflect the rapidly rising demand for "Courtelle," both at home and abroad, in a continually widening range of uses. As stated in the report to stockholders in July, the board's view of the prospects for "Courtelle" is highly favourable. The initial commercial production of "Courtelle" began at Coventry in 1957 where existing annual capacity is 2,000,000 lbs. This was followed by the construction of a 10,000,000 lbs. plant, which started production early in 1959, on the company's 500-acre site at Grimsby. In the same year it was decided to build a second 10,000,000 lbs. plant at Grimsby due to start shortly. The latest decision involves a third 10,000,000 lbs. plant at Grimsby.

NEW RANGE OF FURNISHING AND UPHOLSTERY FABRICS

Less than two years ago "Duracour" made news as Courtaulds' name for a new furnishing fabric, finished by an exclusive process that was non-fraying, easy to care for, tough and long-wearing. Within twelve months it was being used by a number of leading furniture manufacturers, by luggage manufacturers, by Ford Motor Co., for car seat upholstery, and in hotels, public buildings and ships. Now however, "Duracour" means not one cloth but a whole range of woven upholstery and furnishing fabrics widely varying in weight, texture and construction, but all given the exclusive Courtaulds finish to confer the same properties that made the first "Duracour" so successful. There are twelve cloths in the new range, from heavy wool boucle upholstery weave to smooth-textured printed curtainings. There is a wide selection of colour-fast prints as well as distinctive woven colour designs, the total of prints, designs and colours being almost 250. Retail prices of the fabrics are expected to range from 12s. for the lightest to about 33s. for the heaviest, in 48—50 in. widths.

All the fabrics were designed to take greatest advantage of the finishing process and to ensure complete fitness for purpose. To achieve this, new fabric constructions were evolved which often employed unusual blends of natural and man-made fibres. There are, for example, blends of 85% wool and 15% viscose rayon, of cotton and filament viscose rayon, of wool and filament viscose rayon and of cotton and "Fibro". For the highest colour fastness, the fabrics are yarn-dyed, with the man-made content being in general spun-dyed during manufacture. The colours are guaranteed by Courlak Ltd. The largest sales of the range will probably be as piece goods over the counter for home upholstery and curtains, for there is variety enough in the range to meet almost every home furnishing need.

In the furniture manufacturing and upholstery trade, "Duracour" fabrics are already widely used and the new range will give manufacturers in all price brackets an increased choice. In contract furniture particularly the long-wearing and colour fast properties conferred by the "Duracour" finish are expected to increase the applications of the range for hotel, restaurant and bar furniture, and for shipping, aircraft, buses, coaches and rail carriages. Theatre and cinema seating has already been upholstered in the earlier "Duracour" fabrics and the greatly increased range will be of interest to buyers. As a result of the cleanability of "Duracour" fabrics, their non-retention of dust and their gay colours, they will be of great value in hospitals, surgeries and waiting rooms. The qualities of the "Duracour" finish quickly showed that the fabrics would be of great use outside the traditional range of furnishing and upholstery uses. Garden furniture, radio set covers, pram-covers, handbags, bookbindings and a host of other uses were explored, and the new range will give manufacturers in these fields greater scope in design, colour and texture.

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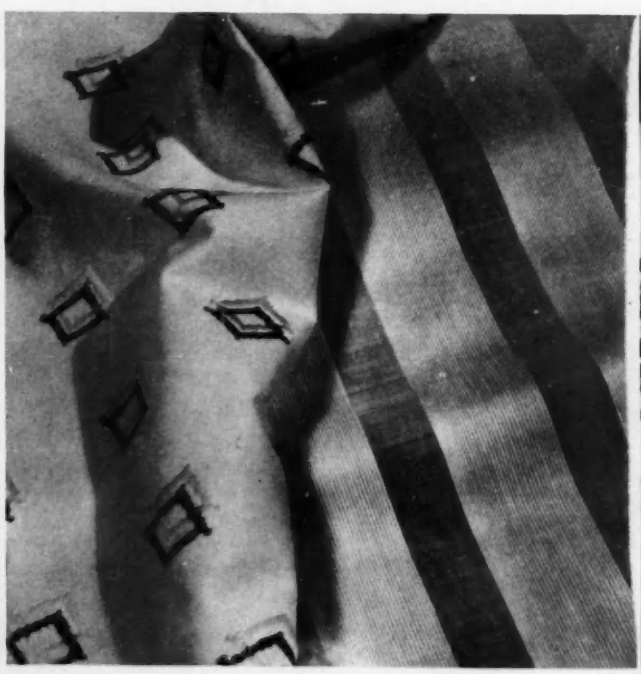
COTTONS FOR 1961

In June the Cotton Board Colour Design and Style Centre staged a display in London under the title "A Preview to Cotton 1961 (see T.M. July, page 256). It was a private exhibition at which leading makers-up, retail store buyers and representatives of buying houses were able to see the many fabric ideas which the British cotton industry has to offer for next year's styles. The exhibition has now been re-staged at the Colour Design and Style Centre at 19 York Street, Manchester 2., and can be visited until October 21st. All the fabrics shown in London are included in addition to many new cloths which have only recently become available. Four of the 250 fabrics are shown below.

On the right is a casual shirting from Simpson and Godlee in white cotton embroidered with diamonds in grey and yellow. On the left is a lightweight woven cotton shirting with a corded stripe in white on white by Joshua Hoyle



The cloth at the top is a lightweight cotton with a lilac satin stripe by Hollins Mill. Beneath is Ferguson's finely drawn fruit stripe in lilac and sharp blue on white cotton "Ferlido"

Physical Properties of Jute Warp Yarn in Relation to Weaving Performance

A review of the literature concerning the forces exerted on warp yarn during weaving, also the importance of certain characteristics of jute in relation to its weaving performance

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NUMEROUS investigations have been carried out and a large number of test procedures developed for measurement of the physical characteristics of textile materials to ascertain their suitability for various end uses and for evaluation of service performance. Attempts have also been made to establish correlationships that may exist among the individual physical properties of textile materials and to find the extent to which the physical properties of fibres and yarns can be utilised for predicting spinning and weaving performance. The development of a suitable prediction formula at suitable confidence level based on the analysis of selected measurable characteristics of textile materials would obviously be of great practical importance since it would eliminate the necessity for bulk trials which are expensive, time-consuming and usually allow only limited facilities for control over the large number of variables encountered in factory production.

It is generally accepted that to reproduce the exact conditions encountered during the spinning and weaving operations is extremely difficult and that only bulk trials can offer a reliable guide to the performance of textile material in processing, but some of the effects that have been made in the development of prediction formula for spinnability of fibres from the measurement of their physical properties may be of interest.

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Turner and Venkataraman,[1] for example, found a high positive total correlation for fibre length and spinning value and a high negative correlation for fibre weight per inch and spinning value from which they developed a prediction formula for the spinnability of Indian cotton. The general accuracy of the prediction formula was confirmed by comparing the actual spinning values with those calculated from laboratory measurements of fibre properties. Chakraborti and Nodder[2] reported that 89% of the variation of the quality ratio of jute can be explained on the basis of the ballistic work of rupture of twisted fibre bundles and bulk torsional rigidity. The work has been extended to olitorius jute by Bandopadhyay *et al*[3] who have reported similar results.

In weaving operations the performance of the yarn in the loom is still regarded as the final test of its weavability but investigations have yielded valuable information on the properties that are important for satisfactory weaving. The apparent lack of a direct correlationship between yarn properties and weaving performance does not however necessarily indicate that the physical characteristics have no bearing on weavability. For example, a weak, inextensible and uneven yarn is bound to produce weaving difficulties and lower the production efficiency. The reason for the apparently anomalous results often obtained in laboratory testing is that the stresses and strains encountered during the weaving operation act in a complex and indefinite way. Also, the contribution of an individual physical property in determining yarn quality may be positive up to a point and thereafter indefinite or even negative; at the same time, the conditions of testing used in the laboratory may be far removed from those prevailing under usage conditions. These factors make it difficult to obtain a prediction formula from mathematical analysis of the physical characteristics.

It is therefore proposed to review the information available in the existing literature on the forces to which the warp thread is subjected in the course of the primary movements of the loom and to examine the importance of certain characteristics of yarn in relation to its weaving performance. Attention is drawn in this connection to certain special properties of jute and other hard fibres. An understanding of this problem is not only of practical importance as regards improving the existing production efficiency and quality but also for the development and evaluation of improved sizing and finishing formulations and techniques.

The looms used for weaving different types and qualities of yarn vary considerably in detail but the basic principles involved in weaving remain the same. The three primary movements involved arise from the "shedding," "picking" and "beating-up" operations. In the first case, the warp threads are divided into two sections, some threads being raised and others lowered by the healds so that a sufficiently large opening or "shed" is formed to allow passage of the shuttle carrying the weft. "Picking" is the operation for impelling, by means of pickers, the shuttle containing the cop from one side to the other during which the weft thread is inserted. The

sley carrying the reed then moves forward and beats up the weft inserted to the fell of the cloth. Other movements also operate such as the let-off and take-up motions but in this discussion attention has been confined to the stresses and strains imposed on the yarn by the first three primary movements of the loom.

The main disruptive forces acting on the warp during shedding are (*a*) abrasion of the yarn against the eyelets of the healds; (*b*) alternating tightening and slackening of the thread at short and regular intervals ; (*c*) abrasion of the yarn against the shuttle during the picking operation; (*d*) driving the weft to the fell of the cloth which requires considerable force particularly for heavy yarns; and (*e*) weaving of close constructions when the yarn is subjected to considerable tension, shock and abrasion. Chamberlain and Snowden[4] have shown from photographic records of the variation in individual warp tension with the help of a cathode-ray oscillograph that a rise and fall of tension occurs as the shed changes, a pronounced tension maximum at the beat-up is followed by a tension minimum. The disruptive forces encountered are markedly increased if the loom is not properly tuned or if there are defective or worn-out parts. Knots, crossed ends due to faulty gaiting-up as also excessive hairiness of the yarn further enhance the frictional forces due to fibre entanglement and restrict the movement of the yarn during the shedding operation eventually leading to the rupture of an otherwise satisfactory yarn.

The nature of the stresses and strains having been indicated it is next of interest to examine the physical properties of the yarn which are of importance in enabling it to withstand the disruptive forces. These properties include (*a*) tensile strength, (*b*) extensibility which includes the elastic, time-dependent and plastic deformations, (*c*) fatigue resistance when subjected to repeated, altering tensions of an order lower than the breaking tension, (*d*) resistance to impact, (*e*) resistance to abrasion and wear, (*f*) regularity of strength and extensibility and (*g*) surface characteristics, e.g. whether hairy, smooth, knotty, etc.

There are similarities in the properties required for materials in the engineering and textile industries and the works of Peirce and co-workers,[5] Leaderman,[6] Eyring,[7] De Witt Smith,[8] Hamburger,[9] etc., have shown that the same physical concepts as have been applied to engineering materials can also be applied to textiles. For example, the fatigue of metals under repeated loading and unloading and the failure resulting therefrom at loads much lower than the special breaking load is well known and this property is also important in textile property studies. In examining the physical properties of yarns the fatigue stress imposed in the loom has therefore to be taken into consideration. Having indicated that the fundamental principles involved in textile production and engineering constructions are similar, the important fibre and yarn properties in relation to weaving are as follows.

Tensile Strength

This property is commonly used for routine testing and quality control. Determination of strength is simple and interpretation of the data is straightforward. Its relation to weavability is however complex although it is obvious that the yarn must possess a certain minimum strength at its weakest point in order to keep the yarn taut and well-spaced so as to allow the passage of the shuttle through the shed. The tension actually applied is considerably in excess of this minimum static tension. The lack of a definite correlationship between the tensile strength as determined in the laboratory and its performance in the weaving shed are mainly due to:—

(1) The test length used in the breaking machine is much shorter than that between the lease rod and the fell of the cloth. In accordance with Peirce's[10] weak spot theory, the number of weak spots present increases with the length of yarn so that the chance of breakage in a longer yarn is higher;

(2) The tension on the thread in the loom does not remain constant but progressively changes as the beam unwinds. In addition to the static tension, the threads are subjected to altering stresses during the shedding and beating-up operations. In view of its practical importance, the implication of altering stresses and the fatigue resulting therefrom on yarn performance is referred to in more detail later. An important point is that the fatigue stress does not bear any definite relation to tensile strength;

(3) The tension along the different portions of a yarn from the lease rod to the cloth fell is not the same. The magnitude of the stresses increases from the back beam to the zone between the healds and the cloth fell and then falls off as the fabric reaches the roller.[11] The zoning of the stresses shows that the point of decisive loading occurs in the vicinity of the shed formation and its reversal. The effect of this is not sufficiently indicated in the conventional laboratory strength testing procedure;

(4) The extensibility of the individual threads comprising the warp sheet may be different from one another. Therefore when yarns having different extensibilities are subjected to approximately the same extent of stretch during say, the shedding operation, the load is not equally divided among the yarns because the less extensible yarns will bear a greater proportion of the load than the more extensible yarns, and may break even if the strength as determined in a testing machine was the same in both the cases;

(5) The distribution of twist, weight and strength along a yarn is irregular. This irregularity has a marked effect on yarn quality and is discussed in more detail later. Thin places usually receive more and thick places less twist than the nominal twist. The contribution made to strength by a higher number of fibres in the cross-section is therefore partly compensated by the higher twist in the thin places so that the coefficient of variation of strength of a yarn is lower than the coefficient of variation of its weight. The relation between the presence of thick and thin places and the distribution of twist along a yarn only holds good in a general way and Oxley and Peirce[12] have shown that it is possible for some thin places to receive lower than the average twist and such places would then be very weak indeed. The presence of these excessively weak spots is not readily revealed in the average strength data.

Extensibility

While strength of warp is important its extensibility is of even greater importance. Unless a yarn can stretch to the extent required during the shedding it will invariably break irrespective of its strength. Snowden[13] has recorded in the case of woollens and worsteds that the yarn which gives most trouble during weaving invariably has many points of low extensibility. He has further shown that the weak spots of low extensibility already present suffer further loss of strength and extension before they reach the zone between the heald and cloth fell. For a low-extensible yarn like jute it is important to carefully control the movement of the healds so as not to impose too much or too sudden a strain on the yarn.

A yarn may also not be equally extensible along its entire length. Any concentration of stress in regions of irreversible extensibility produces deformation at a greater rate and this may ultimately lead to the rupture of yarn even when a substantial part of its potential extensibility remains unutilised.

In order to appreciate fully the behaviour of textile materials in the loom it is important to make a distinction between the reversible and irreversible parts of the total extensibility. In many of the earlier investigations the terms elasticity and extensibility were used synonymously or interchangeably and this led to considerable misunderstanding. A distinction between the two terms is therefore advisable.

Metals can be regarded as perfectly elastic below the yield point at room temperature or, in other words, they extend or contract reversibly and immediately on loading and unloading. Up to the elastic limit Hook's law is obeyed, the ratio between stress and strain being constant and the relation between stress and strain is represented by a straight line. No hysteresis loop is found between the loading and unloading curves which are coincidental and therefore the area enclosed between the loading and unloading curves is zero. The work done in stretching is, therefore, fully recovered on unloading and the material is fully resilient which means that the ratio of the energy recovered from a system to the energy spent on the system to cause its deformation is unity. In contrast to these perfectly elastic bodies, the extensibility of textile materials is a much more complex process.

On loading a yarn an immediate and reversible extension occurs and this part can be regarded as elastic extension. The extension does not however stop at this point but continues, although at a progressively slower rate, till after a considerable lapse of time further extension becomes very slow. This effect is known as the primary creep. In addition to the elastic extension and primary creep there is the irreversible secondary creep or plastic deformation arising mostly out of fibre slippage and fibre tightening and rearrangement.

On unloading, there is an immediate elastic contraction followed by a further contraction at a progressively slower rate due to the primary creep. The plastic deformation on the other hand, is not recovered and the material has a permanent set. The amount of secondary creep gets smaller and smaller at each successive loading and unloading operations till after several cycles it is almost completely removed and the yarn is then said to be mechanically conditioned. A mechanically conditioned yarn thus possesses elastic extension and primary creep and may therefore completely recover in time, although the recovery will be delayed. Such a yarn is called completely elastic as against the perfectly elastic metals. It is, therefore, apparent that the higher the ratio of the primary to secondary creep and higher the rate of the primary creep of a material, the more the material will recover when subjected to repeated stress cycles as are encountered in a loom.

In submitting a textile material to extension, energy has to be spent irrespective of the extension being reversible or irreversible. On releasing the stress only a part of the energy is recovered and the material is only then partly resilient. The resilient property is of considerable importance in connection with the textile performance, the higher the resiliency the better can the material stand repeated stress cycles without rupture. The secondary creep is an energy absorbing component of the total extension but its contribution under repeated cyclic stresses is of a low order since it does not contribute to stress resistance and such a creep is also mostly removed during the first few cycles. In the light of these observations therefore it should be evident that the elongation as commonly measured bears no definite correlationship with weaving performance despite the obvious importance of this property for satisfactory weavability. Two yarns having the same total elongation may possess entirely different degrees of elastic extension, primary and secondary creeps and any relationship sought merely on the basis of total extension is not likely to be truly indicative. These facts offer an explanation as to why the weaving performance of sized yarn is markedly increased despite a reduction of its extensibility on sizing. Caldwell[14] has compared the relative figures for total extension and elastic extension of sized and unsized flax yarn, the results being shown in Table 1.

From the table it can be seen that although the total extension is reduced, the elastic extension is markedly increased on sizing owing to a reduction of the weak inelastic extension caused by fibre slippage, etc., so that not only is there a better distribution of an applied stress but also a greater recovery from the stresses imposed.

Table 1. Total and elastic extensions of flax yarn

Treatment	Breaking strain %	Elastic stretch % (expressed as % of the total breaking strain)
Boiled hank	2·11	30·1
Dry beamed (without sizing)	1·68	47·6
After sizing	1·21	74·1
Sized and tallowed	1·08	79·1

Resistance to Cyclic Stresses and Fatigue

In view of the cyclical nature of the stresses encountered by the warp considerable attention has been directed to studying the behaviour of yarn when loaded repeatedly to values below the breaking point and then unloaded. The loading and unloading cycles have been completed both at relatively slow rates and at speeds comparable to that encountered in the course of weaving.

It has been stated earlier that the load-elongation curves of textile materials on loading and unloading are not coincidental and there exists a hysteresis loop. New[15] has shown for flax yarn that after five loading and unloading cycles, the yarn attains a cyclical condition so that all changes become reversible. He also found that considerable difference exists between different textile yarns—for example between cotton and flax yarn. The attainment of the cyclical condition is not so clearly apparent for cotton although such a trend exists under small loads. There occurs, therefore, a progressive deformation of cotton yarn at each cycle and rupture of the yarn is a certainty if the cycle is repeated a sufficient number of times. In the case of flax, on the other hand, once the cyclic condition is attained the cycles can apparently be repeated a large number of times without breakage, at the range of loads tested. Hamburger[9] gave consideration to the facts (*a*) that textile materials are seldom designed to withstand a single large stress application but rather repeated stress applications of a lower order and that (*b*) to resist deformation, a specimen must be capable of absorbing energy without rupture on loading and release this on unloading, and from these considerations summarised the desirable properties in materials subjected to repeated stress applications. These are (*a*) low modulus of elasticity, (*b*) large immediate elastic

deformation, (*c*) high ratio of primary to secondary creep, (*d*) high magnitude of primary creep and (*e*) high rate of primary creep.

On considering the repeated application of stresses at short intervals of the order encountered during weaving it appears that the elastic extension will assume increasing importance as the time interval between successive stress application is reduced. Assuming for example, that a jute loom is to run at 150 p.p.m. or a time interval between two successive stress applications of 0·4 sec. In addition to the elastic extension only that part of the recoverable primary creep occurring at this short interval will be available after the yarn has been mechanically conditioned after few cycles. Slower speeds will utilise more of the primary creep and stress on the yarn will be lower.

As in the case of fatigue of metals, failure of textile materials can occur at values well below its breaking strength when the material is subjected to the action of repeated altering stresses and this factor is of importance in determining the end breakage rate. Owen[16] found that under such a condition cotton yarn extends rapidly at first and then more slowly and uniformly and finally rapidly again near rupture owing to the pulling out of the fibres. He found considerable variation between the individual yarns when subjected to an oscillating tension, some breaking after a few cycles but others surviving indefinitely. In his opinion a yarn having a limited capacity to extend under oscillating tension will break more frequently than one showing a higher extensibility. Application of sizing, he showed, markedly improves the resistance to oscillating tension.

New and Gregson[17] found that the permanent extension of flax yarn produced under repeated impact forces below rupture is less than that produced by a slow loading between the same loads. On subjecting to impacts the force induced becomes greater at the successive cycles because of the progressively reduced extensibility. The yarn, in his opinion, is never brought to a stage where further impacting does not produce further residual extension.

Borodoviski[11] whose work has been referred to earlier, states that the behaviour of a yarn under repeating stresses is determined by a definite series of laws termed "the theory of endurance." Primarily the yarn endurance is determined by the resistance and stability of the bonds within and between the fibres and fatigue begins with the breaking of these bonds. The limit of endurance is the maximum amplitude which the yarn can withstand without rupture. Obviously the number of stretching cycles which may be applied at the loom must be less than the endurance limit. The limit of endurance depends on the nature of the fibre, twist, size dressing applied and surface evenness but is not related to either strength or elongation at break. When the deformation is less than the endurance limit the number of stress cycles can affect yarn fatigue only to a small extent, if at all, but once the stretching is raised above the endurance limit the number of stress cycles which the yarn can withstand becomes an important factor in determining end breakage rate. On this reasoning the author has proposed a mathematical basis for co-ordinating the yarn quality as assessed by its endurance limit under repeated stressing, cloth construction and loom setting which is useful for reducing the breakage rate and increasing productivity.

Resistance to Instantaneous Impact Forces

This is measured by the ballistic work of rupture in which a known number of threads are subjected to an instantaneous impact force and the amount of energy absorbed in causing their breakage is noted. It is a measure of the combined strength and extension and can either be calculated from the load-elongation curve or more conveniently from the loss of kinetic energy of a pendulum which ruptures the threads.

The impact forces experienced by yarns in a loom differs from those experienced in ballistic machines. Firstly, the force applied in the latter case is sufficiently high to cause an instantaneous breakage of all the threads tested and secondly, the force acts for such a small duration that only the elastic extension will be available for resisting the force applied. Ballistic work of rupture is therefore likely to provide a better index of the performance of a material which is subjected to a strong sharp blow rather than a repetition of a series of blows of lower intensity as is encountered in the loom.

Resistance to Abrasion

The effect of abrasive actions occurring due to the warp yarn rubbing against the metallic or wooden parts of the loom as also due to rubbing against another yarn has been earlier referred to. The resistance to abrasion of a yarn is of considerable importance in relation to weaving performance but no consistent correlationship has so far been established between the two sets of properties. Shinn and Biggers[18] have however found for spun viscose warp that the highest weaving efficiency was obtained with a warp yarn having the highest rating in abrasion resistance. They concluded that a certain amount of abrasion resistance should be maintained but when exceeded, the quality may deteriorate.

Owen and Locke[19] are of opinion that the abrasive quality of a material cannot be defined in terms of the recognised measurable properties of the substance since many physical properties contribute to the quality in unknown proportions. The results obtained in an abrasion testing machine tend therefore to be arbitrary in character the value of which can only be gauged from practical experience. These authors have also reported that the arithmetic mean of the number of rubs endured by a test lot of yarn prior to breakage may be misleading because such a mean is materially influenced by the strongest specimens which can withstand several hundred times the number of rubs endured by the weakest specimen. In their opinion the geometric mean or the arithmetic mean of the logarithm of the rubs is a more reliable index because the frequency of distribution of the logarithm of the number of rubs is more normal.

On the other hand, Matthew[20] has observed that in the case of flax and hemp yarns the arithmetic mean of the number of rubs required for breakage is satisfactory provided the number of observations is sufficiently large. He additionally claimed that the relative quality of a series of flax yarns as estimated by the spinner or weaver generally agreed with the wear test as described. It was further shown that the protective power of the applied size against the effect of abrasion was at its lowest over the range of relative humidity most favourable for weaving from which it was concluded that other factors in addition to abrasion resistance are of importance.

Hamburger[21] is of opinion that abrasion resistance is a complex phenomenon involving many factors such as the type of fibre, yarn structure, type of finish, etc. He has described a method for predicting the inherent abrasion resistance of textile materials

(*continued on page* 390)

Work Study in a Woollen Mill Warehouse

An outline of the control and bonus scheme devised for a woollen mill dealing with approximately 160 pieces for 45 hour week

By "TEXTILE TECHNOLOGIST"

THIS article is concerned with an investigation in the warehouse of a woollen mill dealing with approximately 160 pieces per week, and contains an outline of the control and bonus scheme recommended. The department is at present run by one working foreman and one man with some assistance from an operative from the dry finishing department. The strength during the four-week reference period was the working foreman and two operatives. This article will show that if the foreman devotes half his time to direct work, only one operative is required to deal with the present output, or that envisaged in the near future.

The work content of the following operations has been established in terms of allowed minutes which include provision for the necessary relaxation.

Rolling	**Booking**
Cuttling	**Wrapping**
Weighing	**Packing in bales**
Loading wrapped pieces in lorry	
Loading bales in lorry	

A schedule of work values is set out in Table 1.

Table 1. Schedule of Work Values

Operation	AM's	Per
Cuttling	11·5	piece
Rolling	12·0	,,
Wrapping		
Rolled piece ..	5·7	,,
Cuttled piece ..	7·2	,,
Loading	0·75	,,
Pack in bale		
of 6 pieces ..	46	bale
,, 4 ,, ..	41	,,
,, 3 ,, ..	38	,,
,, 2 ,, ..	38	,,
,, 2 unwrapped pieces ..	48·8	,,
Loading bales ..	3	,,
Cuttling and Rolling Machine		
Starting allowance	5	occasion
Dept. weekly cleaning allowance ..	75	Week

Reference Performance and Cost

The output, bonus, and wages paid for the period of four weeks have been taken as a reference period and the recorded output yields the following data:—

(1) The average weekly reference output of 3,925 AMs per 54¾-hour week.

(2) The average labour performance of 29 AMs per hour.

(3) The reference cost per 1,000 AMs of

Direct labour ..	875d.
Indirect labour ..	191d.
Total ..	1,066d.

Indirect labour has been taken as one half of the foreman's working hours. These hours are available for locating particular pieces which are required for dispatch that day, plus such supervision as is required. The complete reference data is summarised in Tables 2 and 3.

Proposed Plan for Control and Incentive

The present output of pieces per week can be handled by the foreman and one operative in a 45-hour week, and it is therefore recommended that overtime working be discontinued. The departmental performance, taking one half of the foreman's working hours as available for direct work, would then be approximately 58 AM's per hour, which is not sufficient to earn bonus on a straightforward bonus system. In consideration of this, in conjunction with the low reference period performance and the wide variations possible in the number of pieces to be dispatched each day it is recommended to adopt a "geared" scheme. This would have the advantage of paying bonus for performances exceeding 40 AMs of work per hour, and of stabilising the effect of

Table 2. Reference Period Data Period of 4 Weeks

Operative	AM's each	No.	Total AM's
Cuttling	11·8	18	207
Rolling	12·0	631	7,570
Wrapping	7·2	18	130
	5·7	573	3,260
Pack in bales			
of 6 pieces ..	46	32	1,472
,, 4 ,, ..	41	21	865
,, 3 ,, ..	38	16	609
,, 2 ,, ..	38	16	609
,, 1 piece ..	38	2	76
Extra for 10 unwrapped pieces	10·8	10	108
Load pieces into lorry	0·75	387	290
Load bales into lorry	3·0	101	303
Starting allowance	5·0	20	100
Weekly cleaning ..	—	—	300
Total AM's per 4 weeks ..			15,899

Table 3

Direct hours	= 54¾ × 4 × 2½	= 548
Indirect hours	= 54¾ × 4 × 2	= 109
Direct payroll	£57 3s. 4d.	
Indirect payroll ..	£12 10s. 0d.	
Performance	29 AM's/Hour	

	per 1,000 AM's
Labour cost—Direct ..	875d.
,, ,, —Indirect	191d.
,, ,, —Total ..	1,066d.

day-to-day variations in the number of pieces packed and dispatched. The control and bonus plan will then operate as follows:—

(1) The foreman will enter the hours worked and number of pieces cuttled, rolled, wrapped, packed and dispatched each day on the daily work sheet.

(2) Bonus will be calculated daily on the basis of pay performance

$$= \frac{\text{Total AM's of work} + 80}{2}$$

(3) Bonus will be paid to the operative, and to the foreman based on half his working hours on the scale set out in Table 4.

Table 4

Actual Performance	40	50	60	70	80	90	100
Pay Performance	60	65	70	75	80	85	90
Bonus % of time rate	Nil	8⅓%	16⅔%	25%	33⅓%	42%	50%

Available Earnings

With the present work supply the departmental performance will be about 58 AMs per hour which gives a pay performance of 69, corresponding to 15% bonus. Available earnings will be of the order set out in Table 5.

Table 5

	At 69 Performance	At 80 Performance	For Previous 54½-hr. Week
Fore-Man	£ 6 s. 14 d. 4	£ 7 s. 5 d. 10	£ 6 s. 5 d. 0
Man	5 3 10	6 0 5	5 11 8

Results Available

When the output in pieces per week has increased, a standard performance of 80 AMs per hour is to be expected from the department. The cost resulting from this performance (standard cost) will then be:—

	per 1,000 AM's
Direct labour.. ..	453d.
Indirect labour ..	139d.
Total ..	592d.

The saving available as compared with the reference cost is therefore:—

	per 1,000 AM's
Direct labour.. ..	422d.
Indirect labour ..	52d.
Total ..	474d.

This represents an annual saving of about £350 or 40%. At the present level of output of 4,000 AMs per week the performance will be limited to 58 (true), and the saving against reference will be:—

	per 1,000 AM's
Direct labour.. ..	337d.
Indirect labour ..	Nil
Total ..	337d. or 31%

N.B. The pieces mentioned in this report are 54/56 ins. wide × 60/65 yds. long finished

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Jute Yarn

(*continued from page* 388)

by the use of a load-elongation diagram for mechanically conditioned yarns. He found that in the case of nylon, viscose and acetate yarn there is a correlation between the durability coefficient as calculated from the rate of destruction curves of the specimens and their absorption of energy to failure.

Regularity of Yarn

The regularity or evenness of yarn is a property of fundamental importance because other things being equal a strong and level yarn causes the least trouble in weaving. A number of useful electrical and mechanical instruments have been developed for quantitative assessment of the irregularity of yarns and a rapid practical test consists in winding the yarn on a dull, black surface when the variation of thickness becomes readily apparent.[22] Irregularity in yarn may arise from a number of factors such as from the variation of weight per unit length, twist per inch, diameter and strength. These properties are interrelated but the variation of weight per unit length is by far the most important and on it depends the irregularities from the other causes. Considerable work has been done by many workers on the causes and measurement of irregularity among whom the names of Foster,[23] Martindale,[24] Spencer-Smith,[25] Cox,[26] Picard,[27] etc., require special mention. More recently, Banerjee and Sen[28] have presented the results of measurement of irregularity of jute yarn and emphasised the importance of such measurements in relation to jute processing.

It is important to realise that the production of a perfectly irregular yarn is not possible in commercial practice. A perfectly regular yarn contains the same number of fibres in every cross-section so that an ordered arrangement is required. Fibres, however, do not exist in an ordered form but in a randomised fashion and, arising out of the random arrangement, a certain minimum irregularity is unavoidable. For example, Dakin[29] has calculated that if the co-efficient of variation of thickness of a 100's combed Sudan Sakel is 23%, as much as 16·3% is due to the randomisation effect. The minimum target of irregularity in this particular case cannot therefore be zero but must be at least 16%.

In addition to the random arrangement of the fibres there is irregularity arising out of the drafting wave which cannot be entirely eliminated but can be considerably reduced in amplitude by careful roller setting. Each drafting zone, from the draw frame to the spinning frame, introduces its own drafting wave but the irregularity introduced at the spinning zone has the largest amplitude and contributes most to the general irregularity of the yarn. In addition to the irregularity arising out of the two effects, a further irregularity may be introduced by mechanical defects such as the presence of slight eccentricity of the roller.

From the foregoing review it becomes very evident that a number of physical properties of the warp yarn can significantly affect the weaving performance. The contribution of each individual property is indefinite or complex and there is therefore considerable difficulty in developing suitable prediction formulae for weavability from laboratory measurements alone. Considerable information has however been accumulated on the weaving performance of jute warps in the course of surveys conducted on the sizing and weaving of jute and this will be described in the concluding article.

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Box-Chain Making for Dobcross Looms

Whilst the making of box-chains for weft mixing is comparatively simple, the production of chains for fancy checked patterns and complex double cloths requires considerable skill and experience

By N. C. GEE, F.T.I.

LOOMS fitted with four-shelf shuttle boxes at each side of the loom are in great demand for cloths of all kinds in which coloured, or different types of wefts are used. As many as seven different colours can be employed with these mechanisms with the loom running continuously. Even more colours can be used, when new colours are substituted in portions of a wefting repeat, but this is only done when very large patterns are used. It is not, however, popular because changing then has to be done by hand—called "planting"—and this undoubtedly affects production to some extent depending on the frequency of the changes.

Four-box shuttle boxes can be used for weft mixing and, of course, it is a regular practice in both woollens and worsteds when the single wefts are not quite uniform in count, or irregular in thickness. It is equally necessary too when yarns of two or more contrasting colours are twisted together. Box chains are then made to give what is known as a pick-and-pick arrangement (two single picks), that is the weft is introduced into the cloth one pick from shuttle A and one from shuttle B. If a more thorough weft mixing is required, then a three odd-pick (three single picks) chain would be used, and this would give one pick from shuttle A, one from shuttle B, and one from shuttle C.

Occasionally four odd-pick chains are used but only in extreme cases where maximum weft mixing is imperative because of faulty yarn preparation, e.g. unevenness in single yarns, or irregular twisting in folded yarns made of singles having strong contrast. Weaving managers usually regard this last practice as a desperate measure to be avoided for two reasons: (*a*) every piece woven costs more because of the increased payment to the weaver for the extra shuttles, and (*b*) the complex chain required cannot be made without double moves, and only an experienced weaver is capable of coping with such a difficult boxing order. They also claim that the responsibility for faulty yarns rests in the departments where they are produced and this problem should be dealt with there. The extra expense and the more difficult work made in the weaving rooms would not then arise.

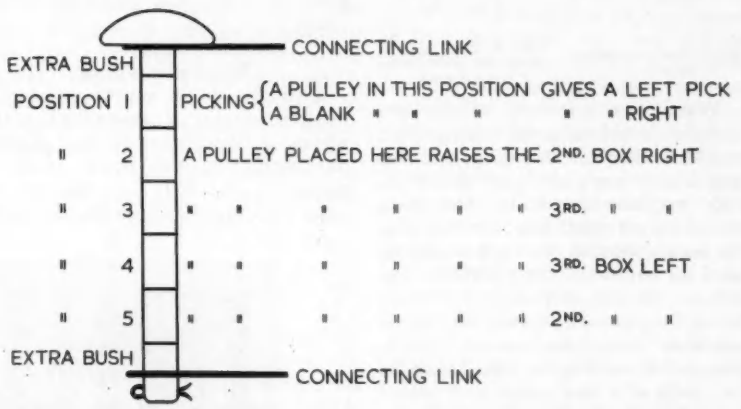

CONNECTING LINK
EXTRA BUSH
POSITION 1
PICKING
A PULLEY IN THIS POSITION GIVES A LEFT PICK
A BLANK " " " " " RIGHT
" 2
A PULLEY PLACED HERE RAISES THE 2ND. BOX RIGHT
" 3
" " " " " " 3RD. " "
" 4
" " " " " " 3RD. BOX LEFT
" 5
" " " " " " 2ND. " "
EXTRA BUSH
CONNECTING LINK

Fig. 1. To raise the 4th box on the right side of the loom, pulleys must be placed in *both* positions 2 and 3. To raise the 4th box on the left side of the loom, pulleys must be placed in *both* positions 4 and 5

Whilst the making of box-chains for weft mixing is a comparatively simple matter, the production of chains for fancy checked patterns and complex double cloths requires considerable skill and experience. Large firms specialising in the production of fancy and novelty cloths find it economical to employ specialist chain makers who can make box-chains for complex and elaborate weftings.

Composition of the Box-Chain

The trainee should first be introduced to the arrangement of the pins, bushes and pulleys which make up the box chain. Fig. 1 illustrates one pin. Each pin in a chain represents one pick made by the loom, and it provides positions where five pulleys or bushes can be placed. In addition there are two extra bushes, one at each end of the pin, which enable the chain to ride on the lag cylinder when the chain is operating in the dobby. There are also two connecting links, one at the top and one at the bottom of the pin, so that any number of pins can be built up into a chain. It is imperative that the positions marked in Fig. 1 are fully understood by the trainee before he proceeds with other instructions.

Fig. 2 shows a photograph of the simplest of box-chains. With this chain no boxes are raised, and reading from the left, the picking starts—on the first pin—with one from the right, and on the second pin, with one from

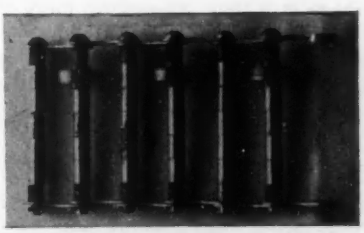


Fig. 2. Box chain for one shuttle using only top box (read from left to right)

the left, and only one shuttle is used. It must be noted that the first or top box at each side of the loom is normally level with the race and that in this case there are no pulleys in the box positions. The chain is made on six links because this is the shortest length that can be used on the hexagonal cylinder. For the purpose of recording box-chain plans, design paper can be used, or paper ruled five squares deep as in Fig. 3, which depicts the chain in Fig. 2.

Fig. 3. Box-chain plan of Fig. 2

Fig. 4. Two shuttle plan, two picks from each shuttle

When it is necessary to use two shuttles on one colour of weft, a chain would be made from Fig. 4, and this would give two picks from shuttle A, and two from shuttle B. The chain would be on eight links. In this case the second box on the right would be used for shuttle B along with the top box on the left. Although this chain is regularly used for weft mixing, it can also be used for weaves where a two-colour wefting is used, such as two picks of a dark colour and two of a light colour.

The weaver often prefers a simple arrangement of this sort but the weaving overlooker with a view to keeping the boxes working at both sides of the loom will use the chain shown in Fig. 5. Whilst this uses an extra box—two boxes at each side of the loom—it helps to keep the operating parts at both sides in good working order. If a more thorough mixing of the weft is required, a pick-and-pick chain would be used. Similarly, this chain could also be used for a wefting plan where two differently coloured single picks were necessary for a desired effect.

Fig. 6 shows a photograph and Fig. 7 a diagram of this chain. The three odd-pick arrangement previously mentioned for (*a*) weft mixing, or (*b*) to give three consecutive picks of different colours is shown in the box-chain plan, Fig. 8. The wefting plan for the colours could be written as follows:—

Colour	A	1	Three picks in one repeat
,,	B	1	
,,	C	1	

and the plan of the shuttle positions showing the positions at the start and finish of the shuttle running at Fig. 9.

When the trainee has become familiar with these simple wefting arrangements he should record the work done by means of three plans—(*a*) the boxing plan, (*b*) the box-chain plan, and (*c*) the plan of the shuttle positions at the start, and finish of the chain.

The Boxing Plan

This plan of the shuttle running is depicted simply, as shown in Fig. 10, which is the order of the shuttle movements in the three odd-pick plan, Fig. 8. *N.B.*—It requires 12 picks to bring the three shuttles back to the starting positions, but a chain on 8 links can be used on the loom. When a wefting plan for a new cloth is received from the designing office he should make a trial boxing plan on paper and when completed examine it carefully making necessary improvements. There are various ways of making imaginary shuttle movements and one easy method is to draw five lines opposite each other to represent four shuttle boxes on the left and four boxes on the right side of the loom. Pieces of cardboard, or leather, or coins can be used to represent shuttles and these should be passed backwards and forwards between the boxes in the order prescribed by the wefting plan.

Figs. 9 and 10 illustrate this. Every shuttle movement must be marked on the trial boxing plan. Pick number 1 in Fig. 10 indicates that the pick was from the right and from the top box to the top box on the left (see pick 1, Fig. 8). There is no pulley in the picking position, therefore the pick is from the right, and there are no pulleys in the box positions, so the shuttle leaves the top box on the right and enters the top box on the left. Pick number 2 in Fig. 10 indicates that the pick is from the left, from the second box left to the top box right.

The pulleys for pick 2, Fig. 8, indicate one in the first or picking position, which means that the pick is from the left, and a pulley in the fifth position will raise the second box on the left, therefore the shuttle will cross the race from the left and enter the top box right. Similarly, pick 3 in Fig. 10 is from the right from the second box to the second box left. Each pick and shuttle movement taken in turn from the boxing plan, Fig. 10, can thus be indicated in a box-chain plan by placing pulleys and bushes in the correct positions (see Fig. 8).

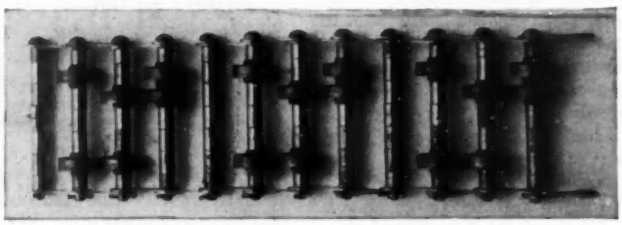


Fig. 8. Three odd pick chain, using top and second boxes each side.

Fig. 9. Plan of the shuttle positions at the start of the chain

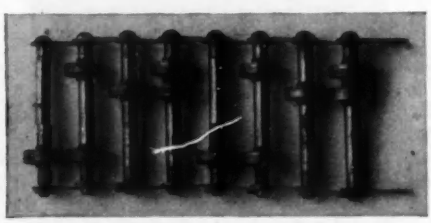


Fig. 5. (left) Box chain for two shuttles, using top and second boxes each side

Fig. 6. Pick-and-pick chain, using top and second boxes each side

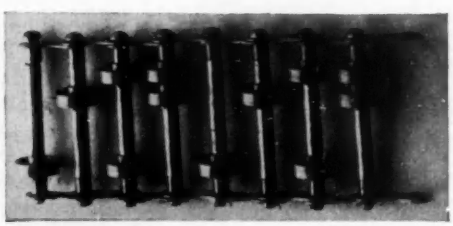


Fig. 7. Plan of Fig. 6

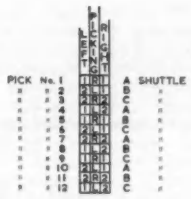
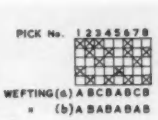
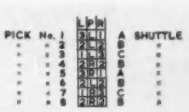


Fig. 10. Boxing plan of Fig. 8



(left) Fig. 11. Box-chain plan using three boxes at each side

(right) Fig. 12. Boxing plan for Fig. 11



The Box-Chain Plan

As the trainee gains confidence he will appreciate the importance of recording the shuttle movements in the form of a boxing plan and from it he will quickly observe whether the moves are good, or not. The following rules will help him in this examination, particularly when the wefting plans are long or difficult:—

(1) Avoid double and treble moves.

(2) If a double or treble move is unavoidable, arrange it so that the shuttle is running into the boxes making the double move and not from them.

(3) A double or treble lift is preferable to a double or treble drop, particularly in looms where the boxes drop by gravity.

(4) When it can be done bring each shuttle into the top box at the side of the loom where the weaver stands, as often as possible.

(5) Balance the boxes.

(6) Arrange to keep the shuttles running into their own boxes as much as possible.

Rule 1.—The careful chain maker will always endeavour to eliminate double and treble moves. If this is not possible he will make changes to limit them because much trouble can be avoided by doing so. For example, unless the timing of the box motions is very good there is always a danger of the pickers getting caught when these moves take place. Shuttle traps, shuttles flying out, split or broken shuttles may be the consequence.

Rule 2.—If the box chain can be made so that any double or treble moves can be arranged at the opposite side to the picking, the shuttle has to traverse the race before entering the box and the extra time thus given generally allows the boxes to complete their movement more easily and the danger of boxes getting fast is reduced.

Rule 3.—Raising of the shuttle boxes in all Dobcross looms is a positive action, but not all are lowered positively. If, therefore, there is a choice in a chain between a double rise or a double drop, the former should be adopted because any hesitation in the dropping action may cause the troubles previously referred to.

Rule 4.—This is intended to help the weaver to observe how each bobbin is running off. It is easier for the weaver to see this when shuttles can be run occasionally into the top box at the side where she normally stands. By this arrangement she is enabled to stop the loom before the wefts become spent, and so save the time which would be lost when the loom is stopped by the weft fork and the pick has to be found by reversing the lags.

Rule 5.—When box-chains can be made so that the boxes are well balanced the looms run much more smoothly. Much depends, of course, on the wefting plan. In many cases it is quite impossible to achieve this condition. The ideal plan is to have the boxes rising at one side when they are falling on the other. Box-chain plan, Fig. 11, on eight links is a perfect example of good balancing and is given as an example to adopt when conditions permit.

The wefting order for Fig. 11 could be either (*a*) or (*b*) and the chain could also be used for weft mixing, using one colour only:—

Wefting Orders

(*a*)—

Colour	A	1	–	Four picks in the repeat
,,	B	1	1	
,,	C	1	–	

or (*b*)—

Colour	A	1	Two picks in the repeat with two shuttles on Colour A
,,	B	1	

Fig. 12 shows the boxing plan for Fig. 11 with wefting (*a*) and Fig. 13 gives the plan of the shuttle positions. *This rule* ties up with Rule 4 to some degree. Even if it is found that the wefting plan does not allow the shuttles to be brought too often into the top box for the weaver's benefit, it is always an advantage to adopt the next best thing and keep the shuttles to their own boxes as much as possible. The experienced weaver strives to learn a new wefting order quickly and the chain maker can do much to ease her work in this respect.

When the trainee is satisfied that he has obtained the best possible shuttle running in his boxing plan—this is the most important part of the work—he

Fig. 13. Plan of the shuttle positions at start of Fig. 12

should number it and record it in a book for future reference. From this plan he will find that he can convert it to a box-chain plan very quickly, and this plan also should be given the same number as the boxing plan, and recorded in the same book. If several long chains are needed at short notice the shed assistants can make the chains from the box-chain plans without help. Care must, of course, be taken to check every pin in the chain to ensure that no pulley has been wrongly placed, and also when the chain is put on the loom, one repeat of it should be carefully woven to avoid the damage which would ensue from a shuttle being directed into a box already occupied.

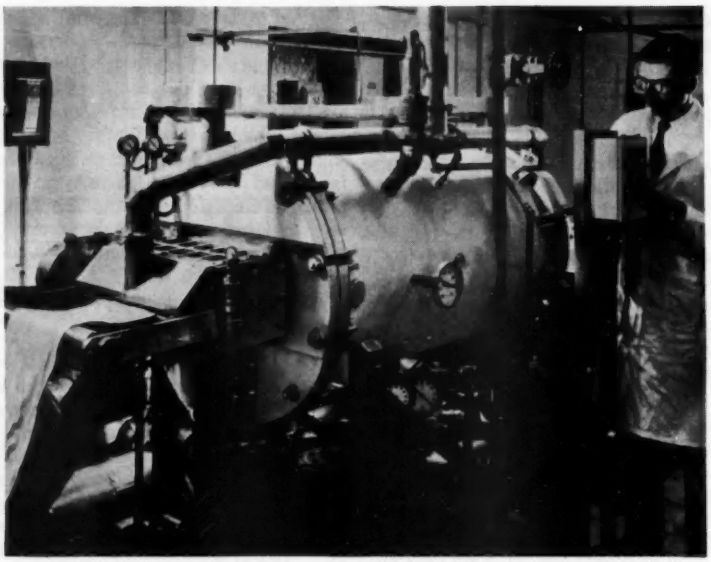
Plan of the Shuttle Positions

The position of each shuttle in the boxes at the commencement of a chain must be marked in diagram form (see example, Fig. 9) and this also represents the finishing positions of the shuttles. Thus the boxing plan together with the plan of the shuttle positions provides the whole of the information necessary to make a box-chain plan and to position the shuttles for the first pick of the pattern. In certain double-cloth and weft-backed cloths the trainee must also take great care to place the first pin of the box-chain opposite the appropriate lag in the pattern chain when the box-chain is being put on the loom. This is essential so that the wefts are inserted on the correct side of the cloth; face wefts on the face and backing wefts on the back.

(*To be continued*)

* * *

NICKEL ALLOYS. Gas-carburising furnaces using Incoloy DS, nickel-chromium-iron alloy; for the retort containing the carbon rich atmosphere is the subject of an illustrated article in the No. 7 edition of "Wiggin Nickel Alloys" (Henry Wiggin and Co. Ltd., Thames House, Millbank, London, S.W.1). Further articles include mechanical seals for pumps and other equipment used in the chemical industry in Monel corrosion-resistant alloys; and descriptions of many types of solenoid valves using Nilo 48 controlled-expansion alloy for the magnetic components.



High Temperature Wet Processing

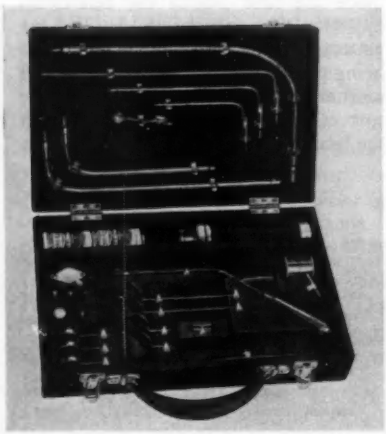
A NEW development in textile wet processing techniques was recently introduced by James Hunter Machine Co., North Adams, Massachusetts. The firm's Pressure-Lok, utilising a patented pressure-seal, makes possible continuous processing of open width webs as wide as 72 ins., at pressures up to 50 lbs. and temperatures as high as 295°F. Shown for the first time at an international exhibition in America, the Pressure-Lok received much attention from visitors from all over the world interested in bleaching, desizing, dyeing and other wet finishing processes, who were quick to recognise the potential of accelerated chemical reactions, which continuous high-temperature processing introduces. The company state that those in the synthetics field see in the Pressure-Lok an opportunity to develop continuous dyeing procedures, and they are continuing to probe the many applications of high-temperature wet processing, and will advise the trade on future developments. The patented pressure-seal has been fully tested mechanically in the laboratory, and its ability has been established to maintain uniform high pressure on the equivalent of many thousands of yards of continuously moving cloth. The laboratory Pressure-Lok machine demonstrated at the exhibition is now available to dyers, finishers and others, for additional research and investigation of continuous high temperature processing procedures.

Industrial Inspection Kit

IN these days of infinite care and attention to detail in the manufacture and maintenance of machinery and other equipment, the need for rigid inspection has become increasingly necessary if guarantees, safety and present day high standards are to be maintained. Oddly, it is the human body with its own specialised needs and means of inspection which has provided the basis for the "Ellispection" kit for industry. We are all used to the doctor looking at our eyes, ears, nose, throat and other portions of the body, with his probes, mirrors, miniature electric lights, etc., and it is the adaption and application of this equipment to industries' own needs that has made it possible to illuminate and inspect the almost inaccessible spots through the unusually small apertures.

This new kit, which is manufactured and marketed by Ellis Optical Co., Mayday Road, Thornton Heath, Surrey, comprises a series of rigid and flexible probes with fixed and movable mirrors, magnifiers and midget battery-operated electric lights, the smallest being $\frac{1}{8}$ in. dia. All parts are interchangeable and interlocking. Thus, one or more parts in any combination, make it possible to probe, illuminate and inspect machinery, castings, dies, pipe assemblies, chemical plants, electronic valves and many other types of plant or equipment. Insulating sleeves are also provided and are slid over the probes when they are to be used for the inspection of electrical equipment.

As will be seen in the illustration, the light compact kit is housed in a fitted, black hardwood case, easy to carry. All metal parts are finished in durable nickel and two standard U.2 type torch batteries, or their equivalent, are the means of power and are housed in the battery handle Spare bulbs and spare batteries are supplied with each kit.



The compact inspection kit in its case

New Grain Brands of Vat Dyes

A unique manufacturing technique has enabled I.C.I. Dyestuffs Division to market a new grain form of vat dyestuff that gives dispersions of high stability. The new FDN Caledon Grains are said to be ideal for all orthodox leuco-dyeing processes, and eminently suitable also for dyeing piece-goods by all pre-pigmentation methods where drying between pigmentation and reduction is not required. Where intermediate drying is required—e.g., in certain forms of continuous dyeing—the SQ Caledon Grain brands should be used.

The excellent stability of dispersions of FDN Caledon Grains enables them to be applied to yarn packages by a shortened pre-pigmentation process developed by I.C.I. In this, the very fine physical form of the dispersed dye results in very uniform pigmentation and rapid establishment of equilibrium between the dye in the liquor and the dye in the packages, dyeing being completed, following the addition of the reducing agents, as in normal leuco dyeing. The initial six vat dyes available in the FDN Caledon Grains form are Caledon Dark Brown 6R, Caledon Brilliant Red 3B, Caledon Blue XRC, Caledon Olive Green B, Caledon Jade Green XBN and Caledon Direct Black AC, and the makers will be pleased to supply enquirers with samples and full technical data.

Reviews

MANCHESTER CHAMBER OF COMMERCE DIRECTORY, 1960-61. Manchester Chamber of Commerce, Ship Canal House, King Street, Manchester 2.

The diversified interests of the Chamber's members are revealed by even a cursory examination of the classified list of products given in the latest edition of this informative directory. The services of the Chamber and its sectional facilities, together with those offered by the Manchester Joint Research Council, are described and, in short articles, Colin Adamson discusses the impact of electronics on industry and commerce and Lord Rochdale chairman of the Cotton Board, outlines the progress so far made towards cotton industry re-organisation and makes some forecasts of Lancashire's response to future problems and adjustments.

S.P.S.

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SKINNER'S HOSIERY AND KNIT GOODS DIRECTORY (including Lace Manufacturers) 1960. Thomas Skinner & Co. (Publishers) Ltd., 44 Brazennose Street, Manchester 2. (price 40s.).

The three principal sections of this publication, now in its thirteenth year of issue, give complete coverage of this group of industries. Details of addresses, directors, nature of equipment and business are given both alphabetically and topographically for manufacturers, hosiery yarn spinners and doublers, with additional lists of dyers and finishers, waste merchants yarn merchants and agents and others engaged in the industries. Over 15,000 entries under 220 classified headings are claimed for the buyers' guide section which is arranged in 6 logical divisions and some 2,500 trade names are listed separately. Finally, mill supplies and services, compiled under headings of the various requirements, such as hosiery machine builders, offers a convenient guide to sources of supply.

S.P.S.

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SKINNER'S WOOL TRADE DIRECTORY OF THE WORLD, 1960-61. Thomas Skinner & Co. (Publishers) Ltd., 91 Kirkgate, Bradford, 1. (price 80s.).

For many years this annual directory has been an essential part of any textile library worth the name, and a ready source of trade information for both buyers and sellers of wool textiles.

Careful and close classification and convenient arrangement ensure ease of use and revision has obviously been carried out, although our criticism of the 1957-58 issue (Textile Manufacturer, Oct., 1957, p.532) in the matter of inadequate treatment of a very lively and growing branch of carpet manufacture still holds good for the latest edition. In the 1957-58 directory four firms were listed under the heading "Carpets (Tufted)", in 1960-61 seven firms are thus classified.

Nevertheless, for details of firms engaged in the sale and manufacture of wool products and the materials, machinery and supplies used to make them, this well produced volume is exceptionally good value for money.

S.P.S.

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JOB EVALUATION. J. Walker Morris, A.M.I.Prod.E. Institute of Industrial Supervisors, 24 Albert Street, Birmingham 4 (price 3s., post free).

The purpose of this well written, compact book (43 pp.) is to explain the working of two of the more popular systems of job evaluation: (*a*) the factor comparison system and (*b*) the weighted points system. In the first two chapters the author sets out his case for job evaluation and then deals with the steps common to both systems. The two systems are then dealt with explicitly, followed by a chapter giving comments on certain aspects of the techniques. This, in itself, is valuable, as there is certainly no place in job evaluation for loose terminology. Intended for supervisory staff, it is a book which should have a far wider field of readers.

A.D.

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MILL MANAGEMENT IN THE 1960's. Cotton Board, Home Trade Dept., 3 Alberton Street, Manchester 3 (price 6s., post free).

Reprinted in a concise form are the papers which were given at the Cotton Board Spring Productivity Conference in February, 1960. The booklet includes: "The Role of the Production Engineer" (H. G. Gregory); "Implications of Re-Equipment" (R. Hodara); "Implications of Multi-Shift Working" (W. C. Crow); also the reports of discussion groups and the concluding remarks by Mr. W. T. Winterbottom.

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TUBES FOR CHEESE WINDING FRAMES. British Standards Institution, Sales Branch, 2 Park Street, London, W.1 (price 3s. net.).

A new British Standard (B.S. 3264:1960) forms one in a series being developed by the Textile Machinery Industry Standards Committee. It specifies a range of wood tubes suitable for traverses of 5, 6, 8, 9 and 10-in. for winding all types of natural and man-made fibre yarns. These tubes provide the user with maximum yarn capacity consistent with tube strength. The standard requires the tubes to be made from fully seasoned birch and the bushes from seasoned boxwood. The tubes have a smooth sandpaper finish followed by two coats of clear varnish.

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TROPICAL SCIENCE. Vol. II, Nos. 1 and 2, 1960. Tropical Products Institute. H.M. Stationery Office (price 12s. net).

Large-scale trials were carried out in British Guiana over the period 1952-58 into the growing and processing of jute and the production of fibre. It was found that one variety of jute from the Sudan and five selections from jute seed obtained from Brazil could be grown satisfactorily on certain soil types on the coastlands of British Guiana. The fibre obtained from certain of these varieties was of high quality and two articles in this publication are concerned with the cultivation, harvesting and retting of jute, and control of jute pests and diseases; both are well illustrated.

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THE COTTON PLANT: How it Grows and Why its Growth Varies. Agriculture Handbook, No. 178. Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C., U.S.A. (price 20 cents).

A well-illustrated booklet of 17 pages which covers germination, root system, leaf, pollination and fertilisation, development of boll and seed, growth of fibre and effects of temperature, moisture, light, nutrients, spacing, etc. Suggested further reading studies are also included at the end of the work. Written by W. H. Thorp plant physiologist, Crops Research Division, Agricultural Research Service) it is an extremely valuable contribution to the literature on this important subject.

A.D.

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WHY COTTON TEXTILE PROMOTION. International Federation of Cotton and Allied Textile Industries, 567 Royal Exchange, Manchester 2.

This booklet contains the address given by Dr. W. T. Kroese (president, International Federation of Cotton and Allied Textile Industries) on the occasion of the 19th plenary meeting of the International Cotton Advisory Committee in Mexico City on May 26, 1960. It also includes the report on cotton promotional activities presented by M. Ortinez (Spain).

Technical Literature

VITREOUS ENAMELLING. A four-colour, brightly designed folder (No. V60) released by Incandescent Heat Co. Ltd., Smethwick, sets out briefly and to the point, a short description of Jetubes (high recirculation radiant tube elements), their applications and proved advantages Applied to vitreous enamelling, Jetubes are said to give amazing flexibility of operation, ease of control and fast, even heating. All these combine, it is claimed, to give output rates and consistency of quality previously unknown in the industry.

MACHINE CUTTING KNIVES. A two-colour brochure with varnished covers is available from T. G. Wostenholm and Sons Ltd., Clough Bank Works, Sheffield 2. It includes a comprehensive display of the company's specialities made for the rubber, paper, food and textile trades. Established in 1908, their output now covers a wide range of circular, straight and specially shaped blades, including standard and super quality blades for rotary and vertical cloth cutting machines and many different types of blades for customer's special requirements.

SPECIALITIES FOR PROCESSING AND FINISHING. Beautifully produced and handsomely bound a new publication issued by Ciba Clayton Ltd., Manchester 11, gives in alphabetical order short general descriptions of the company's range of chemical specialities for the textile, paper, metal and other industries. These include adhesives, printing assistants, stripping and levelling agents, rot-proof finishes, coating agents, emulsifiers, preservatives, anti-frothing and sequestering agents, wetting agents, binders, water-repellent finishes, stabilisers and milling agents, lubricating and softening agents, etc. In each the uses and properties are given together with the amounts required. A centre section in the book is concerned with the fields of application and the last two sections gives a list of products for processing and finisning textiles tabulated according to their application, and an appendix dealing with the preparation of products for use. It is an extremely useful work throughout.

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MOTOR CONTROL EQUIPMENT. Allen West and Co. Ltd., Brighton 7, have specialised for fifty years in the manufacture of motor starting and control equipment for all industrial applications. In addition to standard surface and flush mounting designs, a wide range of equipment is specially constructed to the requirements of the machine tool industry. A new, well illustrated publication (No. 1746/1) gives a selection of such custom-built items including, general features of their control equipment and examples of separately mounted, cavity mounted and machine mounted equipment, also control desks, control switches and accessories.

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CASH IN TRANSIT, ETC. SERVICE. An illustrated leaflet from Factory Guard System Ltd., 9-11 Digbeth, Birmingham 5, details the features of the security services they offer for all types of business premises, large or small. Protection can be arranged either by beat watching or static watching, i.e., provision of permanent or semi-permanent personnel for gate control, patrol watching, etc. In the specialised field of escort security, the company provides a service for safe transportation of cash bullion, jewellery and all kinds of valuables.

SPECIALITY ACETATE YARNS. A concise, beautifully designed folder from British Celanese Ltd., Celanese House, Hanover Square, London, W.1, illustrates in a most interesting manner the extreme versatility and variety of fabric textures which can be made from the Celanese range of speciality yarns. The fourteen yarns dealt with are heavy denier types (600 to 3,000), ribbon-staw,"Celafil," marlspun,"Opaceta" super-white, "Dicel" super bright, poolette, "Seratelle," "Seraceta" slub, "Seracour," "Suracour Duracol" textured yarn, "Seraceta" k.n., "Seraceta Duracol" spun dyed, and "Seraceta" fluorescent. The outstanding features of each yarn are shown to maximum effect by neat patterns in very attractive colours.

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COLOURS FOR 1961. A shade card issued by Alliance Dye and Chemical Co. Ltd., Grecian Mill, Lever Street, Bolton, Lancs., gives patterns of the range of fashion colours retained by Compagnie Francaise des Matières Colorantes, Paris, for spring and summer 1961. The shade card gives dyeing recipes for Diazol "Ultra Cone," Plastosoluble, Amichrome Light and Esterophile dyestuffs. Nineteen striking colours are displayed on the card.

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CONTROL PLUS CO-ORDINATION. Temporary List 310 from Cambridge Instrument Co. Ltd., 13 Grosvenor Place, London, S.W.1, gives a description of the "Numalec" programme controller for temperature/draught or pressure. It is "tailor-made" to give accurate control of processes such as washing and sterilising, rubber and plastic process cycles, chemical processing, etc. The "Numalec" is basically an electro-pneumatic controller employing either one or two Bourdon type measuring systems, and the same instrument can be used to control either simple or complex programmes operating as required, associated alarms warning lights, vents or valves.

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TAKING pH ANYWHERE. Supplement A to List 108 issued by Cambridge Instrument Co., describes a pocket pH meter weighing less than 3 lbs. The instrument scale covers the whole pH range from 0 to 14 units and is calibrated in divisions of 0·2 pH. Accuracy is ± 0·1 pH and the reference and measuring electrodes are combined into a single concentric unit which is not seriously affected by the presence of sodium ions in the range above 10 pH. The instrument is powered by dry cell batteries with a life of approximately 1 000 hours.

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DRAUGHT AND PRESSURE INSTRUMENTS. Cambridge Instrument Co. have published a complete list of draught and pressure indicators, recorders and controllers in an 8-page catalogue (List 47/1). The large illustrations of their latest instruments in this section of the Company's products show the various dials and charts available. The catalogue includes sets of tables giving reference numbers, ranges, weights and dimensions, and standard charts available for various recorders.

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MINIATURE CIRCUIT BREAKERS. A new descriptive booklet from J. A. Crabtree and Co. Ltd. Lincoln Works, Walsall, sets out the features and advantages of their Type C-50 miniature circuit breakers which aroused considerable interest at the last A.S.E.E. exhibition. Claimed to give better protection without fuses, it is an all-insulated consumer's unit embodying circuit-breaker protection and a range of sheet metal enclosures for both industrial and domestic installations is also offered. The circuit breaker has an electro-magnetically operated tripping mechanism; all ratings are set to trip at a maximum overload of 30%. A built-in inverse time-current delay device prevents harmless transient overload causing "nuisance" tripping.

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WOOL CHLORINATION. A well-designed publication available from Ciba Clayton Ltd., Manchester 11, deals with Malafix CH and Melafix II in the chlorination of wool. In a very logical manner it explains the scope of the two processes, preparation of solutions, chlorine combining power, and estimation of available chlorine. Guides to the working procedure for both processes are included, also a section concerned with the chlorination of union yarns and fabrics. Further sections are devoted to requirements to be observed in machinery used for the processes, also the behaviour of dyeings and finishes during chlorination.

Correction Work Study in a Woollen Mill: Warping

In this article (T.M. Sept. page 356) a portion of another article was inadvertently added to the end and appeared on page 357. We regret any inconvenience caused by this error and below appears the proper continuation of the article, i.e., reading on from the bottom of the last column on page 356.

when authorised by the foreman, will be added to the total of allowed minutes produced. An allowance of 75 minutes will be made each week for cleaning. This will automatically be added. Bonus will be paid for good work only. The following example explains the system.

Total number of allowed minutes as given by the warps done—

=	3,450
	75 add cleaning allowance
	3,525

Divide by hours 45
Performance 78½

		£	s.	d.
45 hours at 98/1	=	4	18	1
Bonus 48·3%	=	2	7	3
		£7	5	4

Example of Calculation of Allowed Minutes per Warp

A warp of 3 cwts., 24 strings (80 yds.) with a pattern of 128 ends and a total of 14 sections 17 Yorks. skeins yarn would be calculated as follows:—

$$43 \times 0{\cdot}22 \times 128 + 14\,(7{\cdot}4 + 1{\cdot}25 \times 3) + 1{\cdot}8 \times 3 + 0{\cdot}41 \times 256$$
$$= 43 + 28{\cdot}1 + 151 + 5{\cdot}4 + 105 —$$
$$= 332{\cdot}5 \text{ AM's}$$

The method of calculation for cheese warping is:—

$$48 + 0{\cdot}31 \times 128 + 14\,(7{\cdot}4 + 0{\cdot}94 \times 3) + 1{\cdot}8 \times 3$$

Taking the above example as for cop

$$= 48 + 39{\cdot}8 + 143 + 5{\cdot}4$$
$$= 236{\cdot}2 \text{ AM's}$$

Plant Maintenance and Working Conditions

Factors affecting machinery efficiencies and operative comfort include adequate control over heating, air changes, air filtration and dust removal and temperature, etc., changes inside and out

By F. H. SLADE, A.M.I.MECH.E.

ATMOSPHERIC control, an essential service in many mills, is never other than a costly overhead. There is no reason why it should be rendered more expensive through inefficient operation; disregarding the adverse effects on production should breakdown, from any cause, occur. This is for plant installed to cater for process requirements. Equal care should be given to the maintenance of plant providing for worker comfort, such as for all-the-year-round air conditioning or plain heating and ventilation. For processing, atmospheric control involves the use of plant for drying, and for the control of hygrometric conditions within a working space.

Fundamentals of Drying

The potential causing drying in the process of evaporative drying is provided by differences in vapour pressure. Thus drying proceeds until this zero potential has zero magnitude, when the flow of moisture ceases and a state of equilibrium will exist. During the commencement of drying, moisture is absorbed so rapidly that water is apparent on the surface of the material, and moisture-exchange proceeds as from a free water surface. This drying continues until moisture no longer forms a free water surface as fast as it is evaporated. Drying then proceeds at a uniform rate with an unsaturated surface. When the surface of the material is absolutely dry, the process continues by the evaporation of moisture from the interior, and its absorption from the surface as a vapour. Drying finally ceases when the vapour pressure of the material and the vapour pressure of the moisture in the air are equal.

This fact is utilised to control the moisture content of the materials at the end of the drying process. Control of the vapour pressure of the drying air effects a corresponding vapour pressure control in the material being dried. From the theory of drying it is apparent that

(1) **Air motion is of vital importance, because the rate of evaporation from a free water surface is dependent upon the velocity of air over the surface, as well as the method of directing the movement upon it. The rate of air movement controls the humidity of the leaving air.**

(2) **Temperature and humidity control both the rate of drying and the final state of the dried material.**

Within a given range, any particular design of dryer can be adapted to suit various materials. These, however, require different forms of treatment, or, more precisely, varying conditions of temperature, humidity and air motion. The higher the temperature of drying, the higher will be the drying rate, because the air will have a greater capacity for holding moisture. Though this is conducive to rapid drying, the temperature of drying is nevertheless governed by the nature of the material being dried. The temperature must be suited to the sensitivity of the substance to heat, as some substances are prone to injury from high temperatures in both moist and dry conditions, or are sensitive in a moist condition and not so in a dry one, and vice versa. The temperature, therefore, must be regulated accordingly.

The combination of the rate of air flow with the foregoing factors is very important, because the humid air from the dryer must be removed rapidly enough to prevent drying being retarded. However, the rate should not be so rapid that the maximum moisture-exchange properties of the air are not employed. Sufficient air spaces must be allowed around the material being dried to create a free passage of air throughout the whole drying mass. The usual practice is to adjust the velocity of the air so that the relative humidity of the air leaving the dryer is approximately 75%.

Automatic control of temperature and humidity is necessary in most drying or dehydrating plant. When the air for drying purposes is passed through heaters supplied with steam, temperature control is obtained by thermostat and diaphragm valves for regulating the supply of steam in order to maintain the required air temperature. In order to secure good results the steam pressure must be constant. If this is likely to fluctuate a reducing valve must be installed. Properly selected as regards orifice area, the device will maintain the steam beyond it, in the direction of flow, at constant pressure. Such an arrangement provides for the maintenance of the required air temperature within an embraced or total range of 5%.

One method of humidity control is by the automatic adjustment of mixing dampers which govern the proportionate volumes of low relative-humidity air and high relative-humidity air in the confluent or mixed-air stream. A hydrostat is used to govern the pressure of compressed air in the bellows of lever motors. Bellows expansion is opposed by springs so that the dampers actuated by the levers are adjusted to counteract relative-humidity fluctuations and maintain a constant condition in this respect.

Dryer Maintenance

From the foregoing, it will be seen that the maintenance work required involves the care of temperature and humidity controllers, as recommended by the makers, the periodic lubrication of damper linkages and hinge points, and if used, the replacement of piston cups and piston rod seals on slave cylinders when these components are worn. Cleanliness throughout is most necessary and this also applies to all heat transfer surfaces. Here too, in the case of steam-heated apparatus, attention should be given to such steam line components as stop valves and steam traps.

In so far as the former are concerned it is good practice to (*a*) inspect frequently, (*b*) service at the first sign of a leak, (*c*) keep both valves and pipe lines clean, (*d*) lubricate and pack adequately and (*e*) replace and repair worn parts as soon as it is necessary. One of the primary steps in the maintenance of steam traps is the periodic cleaning of accumulated dirt. A sound plan here is to have a few spare traps which can be used as replacements when traps function incorrectly. The trap taken out of the line can be reconditioned and made ready for service as another spare. Items such as steam traps, reducing valves and other line fittings may be protected from the effects of foreign matter by strainers. They form a profitable investment, but only if they are regularly cleaned.

Two other factors responsible for inefficient operation are air leakages, inward or outward, and lack of adequate heat insulation. These apply to all types of dryers. The first can be readily appreciated when it is known that a gap in a door seam of only $\frac{1}{8}$ in. may result in the loss of 15 to 25% of the heat. This source of fuel loss may be eliminated by periodic testing for leaks; by the application of a lighted taper at points where they are most likely to occur. Loss by radiation, etc., from surfaces not lagged may be 50% of the total heat consumption. Considerable losses also occur in the case of improperly maintained insulation. The least expensive method of insulation is its application in the form of plastic cement after the body of the equipment is erected. Being permanent in character, it does not, however, lend itself to periodical removal and replacement during the normal maintenance of a plant. For this reason, insulation constructed in the form of self-contained panels capable of removal is more desirable.

The simplest of all dryers, from both design and maintenance angles, is the compartment dryer with natural circulation. With these, little or no control of the drying rate is provided, and difficulties are experienced in securing a uniform distribution of drying air through the stock. Stagnant air pockets are also prevalent. An arrangement conforming to many drying requirements is that embodying induced and forced convection. As the intensity of air flow is no longer a function of heat consumption, it is not necessary to discharge air to the atmosphere after passing it only once over the wet stock and, if so desired, the whole of the air flowing through the compartment can be recirculated indefinitely and the proportion of air exhausted can be controlled at will. Similar principles of air circulation are applied to dryers designed for batch or continuous operation.

Air movement is usually provided by a fan or fans of the centrifugal type, direct-coupled to an electric motor or driven through "vee" belts. In very large drying tunnels fans are provided to handle both inlet and exhaust air. General maintenance of these units involves the inspection and cleaning of starter gear and motors, attention to correct belt alignment and bearing lubrication. In those cases where the fan, or fans, is located within the drying space, special attention should be paid to using lubricants designed for high temperature application. All fan impeller shaft bearings should also be inspected periodically for wear.

Chains are used in connection with dryers for a number of purposes, and in particular for power transmission. Here, of course, it is most important to make certain that both the chain and sprockets are accurately aligned, and that the shafts are parallel. Regular inspections should also be carried out to ascertain when adjustment is necessary, whilst all lubrication systems should be checked periodically to ensure that proper oil-flow is being maintained. The cleaning and changing of oil in the oil reservoirs of enclosed drives need to be effected at regular intervals, as does also the filling of reservoirs for drip systems. In the case of the latter the used oil requires to be drained out of the case before it reaches the chain on its low span. In disc ring or splash systems the oil reservoir should be maintained to a level at which the chain will be shallowly yet completely immersed as it passes through the bath.

Air Filtration

Clean air under modern conditions of industrial and traffic intensification can only be achieved by resort to efficient air filtration plant. They are necessary to the satisfactory performance of most atmospheric control installations; particularly to ensure that air introduced from outside sources is free from contaminants likely to soil delicate fabrics. In the majority of cases, even air recirculated within a ventilated or conditioned space should also pass through the filtration plant. The seizure of surfaces in relative motion, due to drying out of lubricant by dust accumulations, is not an uncommon feature of maintenance, neither is the burn-out of motors from the same cause.

It is not sufficient to view the elimination of dust from the viewpoint of process protection and compliance with legislation so far as atmospheric pollution is concerned. Dust is a potential enemy of all operative machinery and the failure of this machinery from the effects of dust, or any other cause, is a marked deterent to production continuity and efficiency. Thus, notwithstanding the importance of dust-free atmospheres in processing, equal, if not greater, emphasis must be accorded to their importance in preventative maintenance.

When air filters are fitted, either for general filtration, or in series to provide high efficiency units giving absolute filtration, or directly to machinery such as air compressors, electric motors, etc., the recommended maintenance procedure is to clean the filters in accordance with the maker's instructions and ensure that all major filters are equipped with air gauges to provide visible indication as to when cleaning is necessary. Preventative maintenance can be planned on a time basis, but some variations must be admitted; it is not possible to ensure that the dust concentrations in the air are of a constant value.

It is also imperative that the right filter is selected to suit the dust it is to intercept. For example, the use of dry fabric filters fitted with replaceable filter media of the type shown in

Fig. 43. Using a low-cost filter medium which, when thoroughly dirty can be replaced easily and cheaply, the Voke K600 "Kompak" filter unit is supplied complete with an angle iron frame. The latter is drilled to allow a number of units to be bolted together to give any desired filter surface area

Fig. 43 is dictated in industrial areas where soft coal is burnt; on account of the sticky oily soot emitted, this causing difficulty when servicing ordinary dry fabric or oil-wetted filters. The utmost care must be taken when fitting a new element to ensure that the full filtering area is completely covered. Cleaning of dry filters constructed of durable materials, as examplified in Fig. 44, must be carried out with the thought in mind that a filter choked with dust cannot function properly. Thus to prevent dust being drawn into the filter, cleaning should be effected as frequently as is economically possible. If an air gauge, similar to the type illustrated in Fig. 45, was not fitted when the filter was first installed, the filter should be inspected daily until it is decided that cleaning is necessary, so determining the operating period most suitable for the particular conditions under which the filter is working. Afterwards, care should be taken to ensure that this period is not exceeded.

When a panel needs cleaning, it is removed, and if the dust collected on the filtering material is of a dry and non-adhesive nature, it is only necessary to shake the complete unit or gently tap the sides. To remove very fine dust which cannot be so dealt with, clean dry compressed air should be applied to the gauze or clean side of the filtering material to blow off any dust present on the dirty side. For this process, the element should be placed on a hollow box, dirty side downwards, and the compressed air pipe, fitted with a shallow flat nozzle attachment, applied all along each fin in turn, so as to deal with the whole of the filtering surface. The most suitable pressure for the work is from 80 to 100 lb./sq. in. Cleaning by this method only occupies a few minutes. Lower pressure may be used, but the time taken to completely remove the accumulated dust would be correspondingly greater, because each fin would have to be blown through much more slowly.

Should the filter be installed in a location where compressed air is not available, an ordinary industrial vacuum cleaner may be used. The method is very similar to cleaning by compressed air, except that the nozzle should be applied to the dirty side of the filtering medium. If neither of these methods will clean the filter satisfactorily, it can be restored by degreasing. The whole inner filter unit should be removed from the outer case and placed in the degreasing plant. After removal, the accumulated dust will then be found to be in a very dry condition, and can be removed by gently tapping the element, or applying either compressed air or vacuum cleaning, as previously described. Recommended degreasing agents are white spirit or trichlorethylene.

The cost of maintenance, both in terms of labour and materials, can be further reduced in the case of some installations by the use of automatic filters; as for example the Autoroll illustrated in Fig. 46. The principle of operation of this equipment, also made by Vokes Ltd., is that a roll of self-bonded secondary acetate fibre is inserted in the upper spool and the material is drawn across the filter aperture on to a lower spool which is driven intermittently by a geared electric motor, or in certain cases, by a hand-operated ratchet mechanism.

The rate at which the material is drawn across the aperture is determined either directly or indirectly by the back pressure, which rises as dust is collected, or on a time basis, the intervals being set as a result of initial experimental running. When the roll of filter material has been fully taken up on to the bottom spool, a length of paper is drawn across the aperture, which, in interrupting the airflow over a vane switch causes an alarm to sound or to be shown, warning the operator that servicing is necessary.

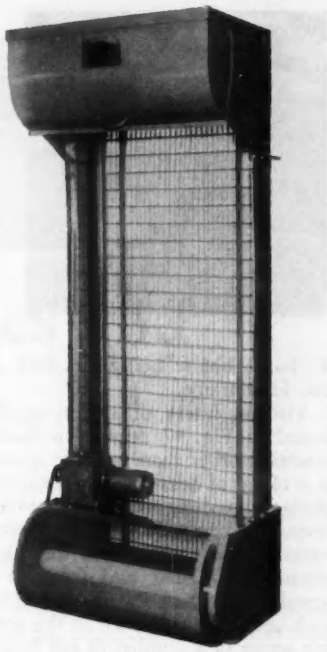
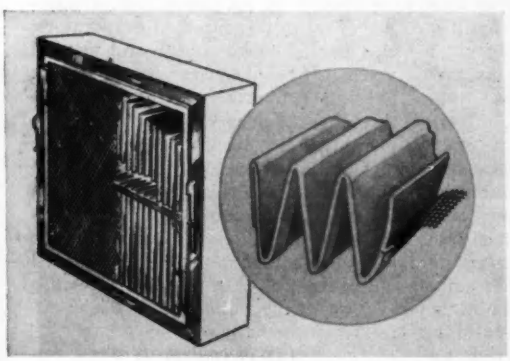
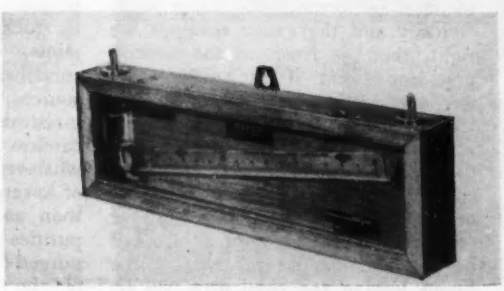


Fig. 46. With the Autoroll maintenance costs are claimed to be reduced to a bare minimum

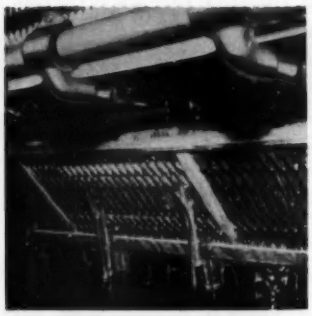
The interval of time between cleaning filter panels of the viscous type depends on the amount of dust in the raw air and the length of the daily run. On an average the necessity arises every eight to ten weeks. Small filters are cleaned one at a time, but with large filters a certain percentage of the cells is, for convenience, taken every week in rotation. For this purpose Visco Engineering Co. Ltd. supply about 10% spare cells with each large filter, as well as a suitable cleaning and re-oiling tank. The dirty cells are washed in a hot "Viscosil" solution and dried, immersed in a bath of "Vistenol" air filter oil and then allowed to drain. Changing the cells takes only a few minutes per cell, but the re-oiled cells must be allowed to stand in a vertical position for at least



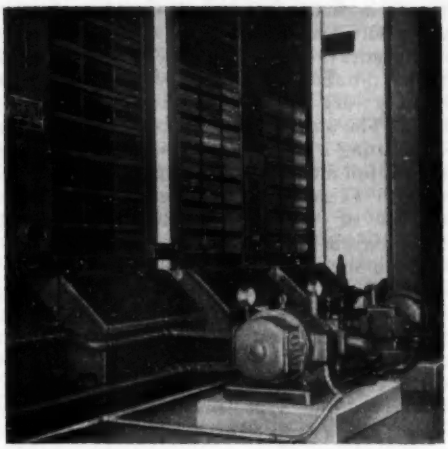
(left) Fig. 44. View showing construction of Microvee dry fabric panel with details of element medium. This unit, which has an efficiency rating of 99·9%, will remove particles down to 5 microns, or less in size



(right) Fig. 45. The right moment for cleaning may be found by measuring the resistance with a "Visco" air gauge



(left) Fig. 48. The jets of oil strike the top of the cell and then pour through the plates into the tank below



(right) Fig. 47. Visco "Reciprojet" automatic self-cleaning air filters, showing oil tanks, pumps and motors

12 hours before being put back into the filter frame.

Viscous filters of the type illustrated in Fig. 47 require no manual attention other than periodic greasing and oiling of bearings and removal of sludge from dirty oil tanks. Automatic operation controlled by time switch ensures that each cell is thoroughly cleaned at regular and frequent intervals, i.e. when the dirtiest cell in each section is subjected to the scouring action of a number of full bore oil jets which move backward and forwards across the width of the cell. The dirty cells are initially tilted to allow the oil jets to wash the dirt forward and downwards through the cell plates, and, as the dirty cells move during the cleaning operation from the initial sloping position to the bottom of the column on the inlet side, the oil jets effectively scour and clean the front or dirty faces. This operation is illustrated in Fig. 48, which shows the jets of oil striking the top of the cell and the oil pouring through the plates into the tank below.

Refrigeration Plant

Where attainment of the desired atmospheric conditions demand recourse to refrigeration, it is well to remember that satisfactory operation can only be achieved if such a plant is properly charged. When the plant is running steadily, it may be judged by the operating conditions whether the plant is fully charged or not. In general, it can be assumed that if the plant is performing its duties satisfactorily and the gauge readings are right, there is frost on the suction pipe (or sweat if the evaporating temperature is near or above the freezing point) and the delivery pipe is hot, the plant is properly charged. If the system is undercharged, either the condenser or the evaporator is short of gas. If the condenser is short of gas, the condenser gauge readings will be low and the temperature of the liquid leaving the condenser will be high. If the evaporator is short of gas there will be no frost on the suction pipe and the suction pressure gauge readings will be unduly low.

In the case of a plant that has been fully charged but has become undercharged through gradual loss of gas, the first indication will probably be that the plant no longer does its work as it previously did. Other practical symptoms are that the expansion valve has to be opened wider than usual to obtain frost on the suction pipe, and the liquid pipe between the receiver and expansion valve will feel warm to the touch, i.e. warmer than the condensing water.

On the other hand, operating troubles can be caused by overcharging, indicated by an excessive condenser pressure and over-sensitivity to adjustments of the regulating valve. This does not often occur, and it will be found that an excess condenser pressure is usually due to either the pressure of air or other non-condensable gases, dirty condenser tubes or insufficient water. Air can be accounted for by the plant not being completely evacuated before charging with refrigerant. It can also be introduced into the crankcase of the compressor with the lubricant, and in the case of a plant working at a pressure below atmospheric, air may be sucked in through leaking pipe joints, stuffing boxes, etc. Non-condensable gases arise from many sources, such as oil decomposition, moisture in the system; traces of careless galvanising, etc. In any case, whatever the cause, the result is that of lowered operating efficiency and as soon as the presence of these impurities be indicated they should be purged from the system. Generalising, of the points to be observed for efficient operation those of the condenser and evaporator temperatures are the most important. The condenser must be as cool as possible, and the evaporator must not be at any lower temperature than is required to do the necessary refrigeration.

Mechanically there are a number of features requiring constant attention. Correct lubrication is, of course, most important, using the specified grade of oil and ensuring that the oil strainer is periodically cleansed. Glands, or stuffing boxes, where fitted, must be checked at regular intervals to prevent the escape of gas. If trouble with leakage is encountered, the gland should be tightened, preferably while the machine is running, until the gland begins to run hot. The machine is allowed to continue running until the gland commences to cool off, when, if necessary, it is again tightened. In the case of a gland packed with soft packing, it is common practice to tighten the gland after the compressor has stopped, and then slacken it off before starting. Re-packing is carried out when tightening is no longer effective.

Other features not to be overlooked are stop valve packings, the periodic cleaning of the suction strainer, emptying of oil drains fitted to evaporators, and testing of discharge and suction valves. If the discharge valves are not holding properly some of the gas discharged during the upstroke of the piston will leak back through this valve on the down-stroke. This results in the generation of heat and may be shown up by the machine running excessively hot. If the suction valves are leaking, the compressor equally will not pump well, but this will not cause heating to the same extent.

(*To be continued*)

TEXTILE MACHINERY and MILL EQUIPMENT NEWS

Pressure Dyeing Fabrics and Sampling Facilities

Constructed to work at pressures up to 30 lbs./sq. in., this automatic dye jig has a two-speed motor giving two different speeds for a batch of up to 25½ ins. dia.

THE necessity for dyeing "Terylene" and nylon, etc. fabrics under pressure—especially when dark shades are concerned—obviously called for the introduction of a pressurised open width dye jig. From the mechanical and engineering stand points this presented little difficulty and no trouble was experienced in designing satisfactory machines for this purpose. In the case of the Benninger Engineering Co. Ltd., Uzwil, Switzerland, their pressurised machine was on the drawing board in very quick time but the question soon arose as to how it might be possible to take samples of the work in progress without the delays usually associated with reducing pressure in the machine, unbolting the cover and—if the sample should prove unsatisfactory—refastening the cover and raising pressure again to continue the dyeing cycle.

The company say that the simplest solution was a by-pass arrangement with a small chamber containing a sample of the fabric and this was thoroughly tested under mill conditions. It was found, however, that the dyeing conditions in the chamber could not accurately reproduce those in the main vessel—tension on the fabric for example affects the shade—with the result that the sample in the chamber was not identical with the main body of the cloth. The only certain way of securing a true sample, they point out, was to take it from the piece in process in the machine and this involved the designing of a complex sampling device which could be used to cut a sample from the piece, bring it into a chamber which could then be isolated from the main pressure vessel and the sample then released for withdrawal.

After considerable experiment Benninger achieved this result and the method of operation of this patented device is that the operator inserts a

(left) The Benninger pressurised automatic dye jig for nylon, "Terylene," etc.

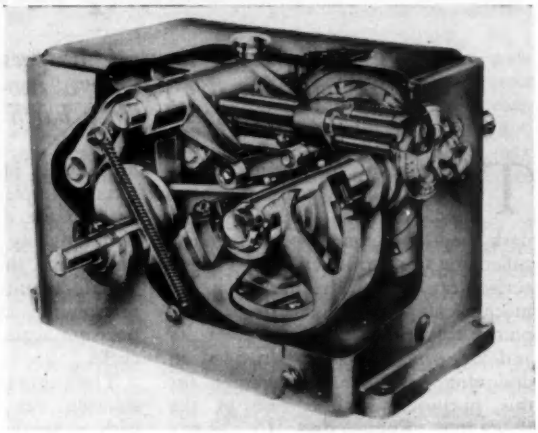
(right) Removing a sample from the jig without reducing the working pressure

stainless steel wire, on the end of which is a barbed hook, through the sampling chamber; the barb penetrates the cloth, after which a knife cutting mechanism is operated by means of a handle outside the machine and a circular piece of cloth about 4 in. dia. is cut from the fabric. The wire is then withdrawn through the sampling chamber with the sample attached. This operation takes no more than 2 min.

Automatic open-width high temperature dyeing is claimed to be the most successful method for the dyeing of fabrics of polyester, polyamid and other synthetics—also mixtures with rayon or cotton—to give perfect penetration, colour fastness to light and rubbing and a considerable reduction in dyeing time. As an example a black "Terylene" can be produced in a dyeing time of about 6 hours; a dark navy in about 4 hours. The pressure jig, it is stated, has several advantages in absolute creaseless running of the cloth; careful treatment of all fabrics; automatic operation; a two-speed motor giving two different fabric speeds for a batch of up to 25½ ins. diameter. The dye liquor is heated by means of indirect steam heating arrangements and additional direct heating produces the required temperature and pressure in the minimum of time. The machine is constructed to work at pressures up to 30 lbs. per sq. in. (tested to 60 lbs. per sq. in.) and for temperatures up to 140°C.

(Agents for the Benninger in the British Isles are Barke Machinery Ltd., 100 Portland Street, Ashton-under-Lyne.)

Compact Variable Speed Unit



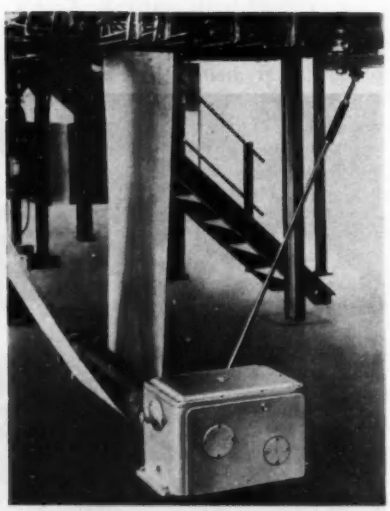
Cut-away section showing the interior details of this new variable speed unit

THE "CONtorq" unit, recently announced by Fairbairn Lawson Combe Barbour Ltd., Leeds 1, is a new venture into the field of variable speed transmission. The unit is of comparatively simple construction, built on robust lines to precision standards. The "CONtorq" is claimed to be revolutionary in that it is completely positive, based on sound mechanical principles and, by the complete absence of fluid or friction properties, will maintain accurately the selected speed, regardless of changes in temperature, humidity or atmospheric conditions.

The standard unit operates from a constant input speed of 450 r.p.m., which gives an infinitely variable speed range on the output shaft of 0 - 50 r.p.m. Speed changes are made by the turn of a graduated dial, and speed changes may be effected whilst the unit is in operation or at rest. Remote control by servo or push buttons can be provided if required. As the name implies, the "CONtorq" will transmit constant torque throughout its entire speed range.

The unit has been designed on pleasing modern lines, finished in polychromatic paint and has machined faces both on the input and output sides. These machined faces are intended for the mounting of auxiliary equipment, i.e. flange-mounted motors, output attachments such as worm and wheel units, bevel attachments for change of direction, differential arrangements which will increase the output speed from 0 - 100 r.p.m. or a variation of 100 r.p.m. at practically any speed, i.e. 200 - 300 r.p.m., or 900 - 1,000 r.p.m.

Provided with a machined base, and four holes for fixing bolts, the unit can be supplied with either right- or left-handed input and output shafts. Completely sealed and self-lubricating, with oil level indicator, the unit will run continuously with no attention other than an occasional topping-up with oil.



One application of the CONtorq unit

New Publications

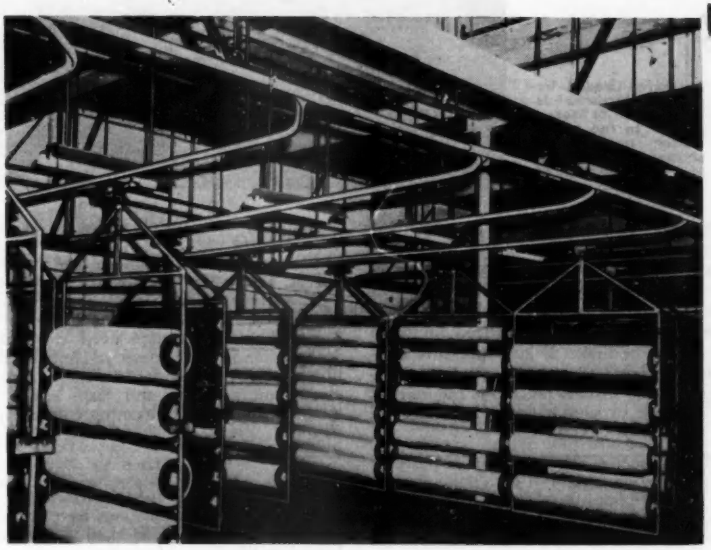
BRITISH AND DOMINION TEXTILE INDUSTRY, 1960. John Worrall Ltd., Central Works, Oldham (price 30s.).

Customary care and accuracy have been exercised in the compilation of the 70th edition of the "B. & D.," which covers the textile industries of the United Kingdom and Ireland (apart from Lancashire and Yorkshire) and of the principal overseas Commonwealth territories. The classification and arrangement of the directory sections, including the Buying Section, make for easy reference, and much reliable and essential information can be gleaned from other sections concerning commercial, technical and educational organisations serving the textile industries and from the statistical tables.

INDUSTRIAL PROTECTIVE GLOVES.—British Standards Institution, 2 Park Street, London, W.1 (price 10s. net).

The 17 types of gloves specified in the revised BS.1651 : 1960 offer protection against the majority of industrial hazards to which the hands are vulnerable. Materials for the gloves fall into four groups: leather, plastics, rubber and cotton. "Experiments," state the foreword, "are being carried out with new material for gloves and glove linings made from man-made fabrics and mixtures of man-made fibre and cotton. Depending on the outcome of these experiments, an amendment to the standard may be issued later." The 46 pp. publication specifies design particulars, and size, etc.

Lightweight Conveyor System



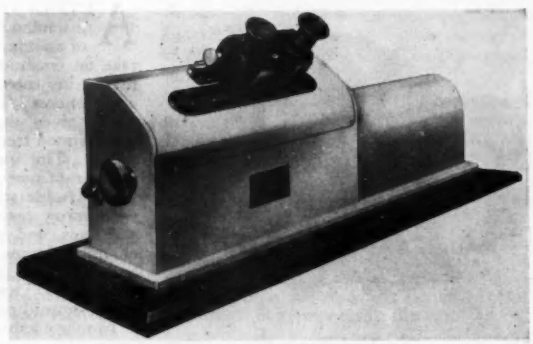
For many years makers of a very wide range of mechanical conveying and elevating equipment, T. and T. Works Ltd., Billesdon, Leicester, have now become sole concessionnaires for the manufacture and distribution in the U.K. and most Commonwealth territories of the overhead monorail conveyor system made by Chainveyor Corp., Los Angeles. It is a system incorporating several valuable design features and, it can be arranged to run horizontal, up, down, vertical and, in suitable cases, even inverted.

Low weight per unit length combined with a relatively high carrying capacity ensure that the Chainveyor will carry any unit load which is not too heavy to be handled on or off the conveyor by manual effort. It is applicable to almost every type of industry and duty from e.g., conveying single office record cards up to individual loads of 120 lbs. such as cuts of cloth, yarn beams, weft boxes, card cans, machine spares, etc.

The makers state that standardisation and simplicity of component parts and elimination of units involving rapid wear, result in substantial savings in both initial cost and upkeep. Inherent in the design is the virtual total enclosure of all working parts of the main conveying unit. Lightness in weight, good design and clear working instructions enable those firms with good mechanics or maintenance departments to carry out their own installation and erection. Disruption of normal is kept to a minimum and, is certain cases, it is not affected at all.

The illustration shows full condenser spools being transported to various locations in a large spinning mill. This installation covered two storeys and was fully powered

Constructional Features of New Viewing Instrument



The Type ZK1 web viewer

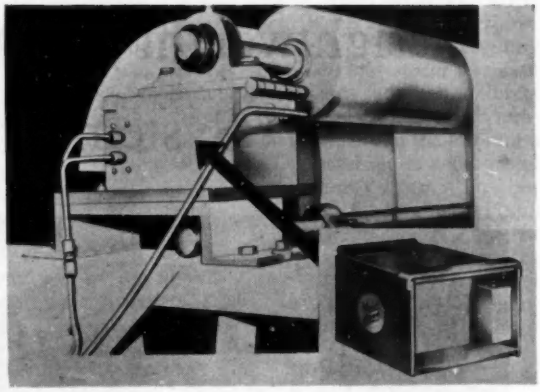
The importance of examining material for printing quality as it runs through a rotary press is something every operator knows. He also knows it is virtually impossible unless he stops the machine or uses a web viewer, an optical device synchronised to the speed of the web. With this the operator sees what is apparently a stationary picture of each section of the web he wants to observe. It works electrically or mechanically with a mirror system, and a built-in magnifier can be used to enlarge specific sections for closer examination.

The Mount Hope/Barr and Stroud viewer (Type ZK1) is a robust instrument which can cope with a web running at 1,000 ft./min., and special lighting is not required, also the colour and size of pattern are shown as normal. The viewer can be supplied as a unit, with a built-in motor and base. A second motor is then included in the unit and this is geared to the printing machine. This second motor governs the viewer's driving motor, so that the viewer speed is fully synchronised to the printing machine. The only connection between the two machines is an electric cable.

Normally, the viewer is set in front of the web, but if that is impossible for space reasons, further mirrors can be set so that the web is under observation from the side of the printing machine, or even on top. One essential part of the viewer is a device that ensures rapid adjustment to suit any repeat lengtn which may be encountered.

The viewer is designed to cover most operating conditions, according to the distance it is placed from the web. The ideal distance is not less than twice the maximum repeat length, but this can be reduced to one-and-a-half times the repeat length. On this principle, the viewer should be 36 ins. away from the web for a repeat length of 18 ins., but the distance could be reduced to 27 ins. whenever necessary. An easy-to-operate control knob makes the mechanical adjustments to suit repeat lengths from 18 down to 7 ins. The width of web reflected in the viewer is roughly equal to its distance from the web. Barr and Stroud Ltd., who manufacture this web viewer, are well-known as specialists in building fine precision instruments of this type and further information will be gladly supplied by the U.K. distributors, Mount Hope Machinery Ltd., Green Street Green Road, Dartford, Kent.

Controlling Tension on Fabrics, etc., during Processing



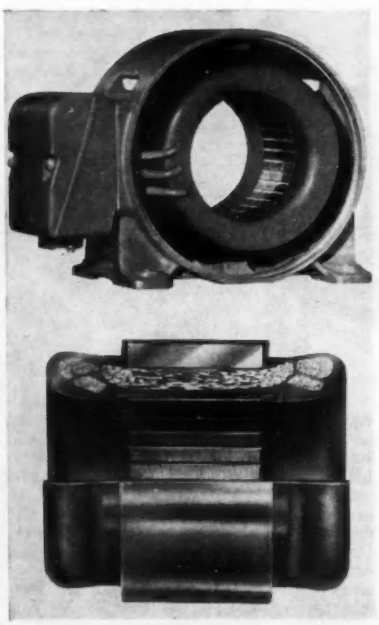
Pressure caused by tension in web is transmitted to "force piston" in the transmitter unit. Inset shows hinged cover of unit and top of piston

MANY of the modern machines for processing textile, etc., fabrics are fitted with a built-in tension control unit and these have undoubtedly proved their efficiency in quality control by eliminating most of the tension troubles, and thereby reducing processing costs.

The Mount Hope tension control, shown here, is claimed to be one of the simplest, surest ways of achieving constant, uniform tension of all webs. When it is fitted the web passes over a roller supported on one end by a journal mounted on a load-sensing transmitter. Any pressure caused by tension is immediately transmitted to a "force piston" in the transmitter unit—sensitive enough, it is said, to pick-up a pressure change of 1 oz.—and with split-second precision the necessary adjustments are automatically made. These adjustments are made by varying the air supply (the control is air-operated throughout) to the clutch or brake to keep pressure constant on the material during the entire operation. Constant tension is maintained by a brake or clutch controlled through pneumatic, mechanical, hydraulic or electronic means.

Mount Hope Machinery Ltd., Green Street, Green Road, Dartford, Kent, state that tension control is trouble free and dependable. Simple to operate, they point out that only three steps need to be taken and tension is under positive control. It is already fitted as standard by many American manufacturers and can easily be adapted for fitting to existing equipment.

New Winding Treatment for Motors



(above) Drip proof type stator treated with epoxy resin encapsulation
(below) Stator/rotor unit in section showing the degree of penetration of the compound into the slots and interstices of the coil formation

ALTHOUGH they are not really intended for tough duties about 10% of standard industrial electric motors take an enormous amount of harsh treatment in moisture or chemical laden atmospheres. These conditions have naturally given the motors a short life and necessitated frequent rewinding or replacement. The range of British Standard drip-proof motors made by Brook Motors Ltd., Huddersfield, can now be supplied with epoxy resin encapsulation of the end windings and slots. Moisture, oil grit, chemical fumes, and the majority of acids and alkalis are prevented from entering the windings. This treatment is invaluable where humid conditions apply.

In many applications including chemical processing, soap and detergent manufacture, rayon and nylon spinning, etc., motors treated with epoxy encapsulation could greatly extend motor life, perhaps 10 to 20 times. This, plus the savings on repeated maintenance, rewinding or replacement cost and out of service time, could amply justify the cost of the treatment. The treatment would be particularly helpful where regular hosing down of plant occurs or in cases of occasional flooding (providing, of course, that terminal boxes and other connections were suitably sealed).

Brook Motors research laboratories have undertaken a vast amount of work in testing the treatment under widely varied conditions and their recommendations are available to any prospective user of encapsulated windings on receipt of full particulars.

Technical Information

The following publications have recently been issued by I.C.I. Ltd., Dyestuffs Division, Blackley, Manchester:—

No. 560. Dyeing of Black Shades on Synthetic Fibres and Their Unions.
No. 561 (replaces No. 524). Procion/Soledon Combination in Dyeing: Production of Yellow/Green Shades on Cotton and Viscose Rayon Fabrics.
No. 562. Printing of Acrylic/Cellulosic Fibre Unions.
No. 568. Printing of "Terylene"/Wool Fibre Unions.
No. 569. Detection of Surface-Active Agents in Textile Fabrics.
No. 570. Determination of Colour Fastness.
No. 571. Use of Velan PF and Velan NW in the Production of Durable Oil- and Water-Repellant Finishes on Textiles.
No. 573. Wool Dyestuffs: Effect on Shade and Wash Fastness of the Stevenson "X" Process for Dylan Shrink-Resistance Wool.
No. 575. Wool Dyestuffs: Fastness to the "Sironized" "Easy-Care" Finish for Wool Fabrics.
No. 578. Disperse Dyestuffs on Nylon: Fastness to Mechanical Washing.

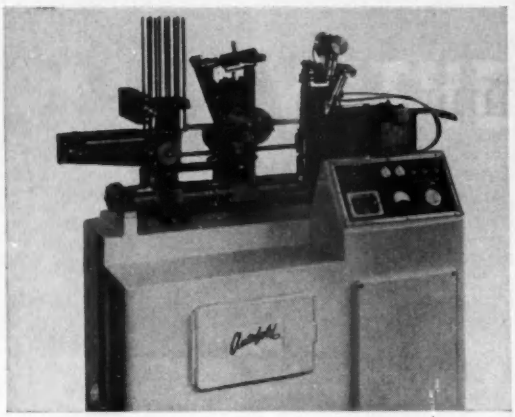
Auxiliary Products

No. 127. Fluorite RP for Textiles.
No. 131. Dispersol CWL. A New Level-Dyeing Assistant for Wool/Dyes.
No. 132. Fluorite MP Liquid (Applications in the Textile Industry).

New Sales Office

Albright and Wilson (Mfg.) Ltd. have opened a sales office in Imperial Buildings, 72 High Street, Belfast (Tel.: Belfast 32312). They produce a wide range of compounds based on phosphorus.

Electronically Controlled Label Cutting Machine



The "Autofold" occupies less than 7 sq. ft. of floor space

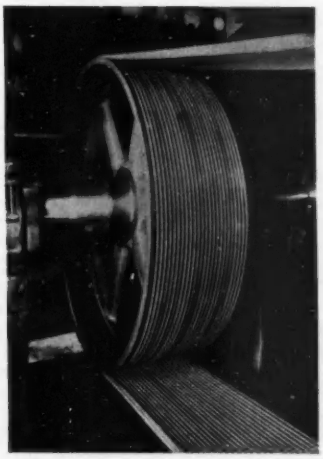
A NEW "Autofold" label cut and fold machine announced by Textile Automatics, 81B Gladstone Street, Leicester, operates at 60 - 80 cut labels/min. and handles both woven and printed fabrics. Pointing out that the machine is self-correcting, the makers say that where faulty register or weaving irregularities cause a change in length, the label is electronically positioned by an optical photo-head. Changes in length of label make no change in the length of fold provided at the ends.

All types of label—cut only, end fold, centre fold and mitre fold—are accurately cut and stacked for examination and boxing. One label is completed at each revolution and is automatically counted. The range of label webbing which the machine will handle is from $\frac{1}{4}$ to $2\frac{1}{2}$ ins. wide. End fold labels between 1 and $4\frac{1}{2}$ ins. long after folding can be accepted, and the standard fold-under is $\frac{1}{16}$ in., although it can be varied from $\frac{1}{8}$ to $\frac{1}{4}$ in. The ends can be folded separately. Cut labels without folding can be accepted in the range 1 to 5 ins.; centre fold labels are folded 5 to $2\frac{1}{2}$ ins. and 2 to 1 in. Mitre fold labels are acceptable in webbing widths ranging from $\frac{1}{4}$ to $1\frac{1}{2}$ ins. The normal length of tab is $\frac{1}{4}$ in. but it can be increased to a maximum of $\frac{1}{2}$ in., and decreased to a zero minimum. The length range after folding is from $1\frac{1}{2}$ to $4\frac{1}{2}$ ins.

The machine occupies just under 7 sq. ft. of floor space and is supplied with all attachments to complete the folds specified. Built to precision tolerances, all parts are interchangeable, and it can be connected to the existing power supply. The makers have also instituted a cutting and folding service to help manufacturers who put a machine on order. A customer can have an agreed quota of labels cut and folded so that he can put his labels on the market immediately, without waiting for delivery of the machine. The service can be extended to give assistance to customers during extremely busy periods.

One-Piece Multiple V-Belt

A Midlands pulley manufacturer has installed new ribbed type "Poly-V" belt and after numerous tests, reports smoother, steadier, trouble-free operation with no vibration.



A single 9 ins. wide "M" section "Poly-V" belt has replaced 10 "D" section V-belts on this alternator drive

The photograph shows a single 9 ins. wide "M" section "Poly-V" belt manufactured by Turner Brothers Asbestos Co. Ltd., Rochdale, which replaced 10 "D" section V-belts on this diesel alternator drive, thus saving 40% in pulley space. The "Poly-V" drive has been in use for some time in the engine house at Smith and Grace Ltd., Thrapston, Kettering. Installed under ideal test conditions, this 140 h.p. engine (500 r.p.m.) to 90 kW alternator (1,000 r.p.m.) drive is running alongside two equivalent endless V-belt drives—all of which are under constant surveillance through the load indicating instrument panels installed in the engine house.

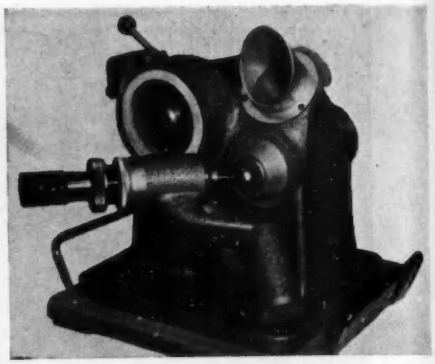
It is claimed that since the installation of the "Poly-V" drive some three-and-a-half years ago, the drive has been maintenance-free, trouble-free and has had no adjustments on centre distances. Furthermore, there has been considerable saving in drive weight; equal power obtained from narrower pulleys and it has been proved conclusively that this 9-in. wide "M" section "Poly-V" belt is more efficient than the matched set of 10 "D" section V-belts originally fitted.

New Direct Dye Gives Fast Turquoise Shades

The main value of Durazol Turquoise Blue FB, a new homogeneous direct dye, marketed by the Dyestuffs Division of I.C.I. Ltd., is on cellulosic fibres, on which it gives brilliant turquoise blue shades of high light fastness. The new dye possesses better washing fastness than Durazol Blue 8G and has good solubility and good level-dyeing characteristics.

Besides its use in self-shades Durazol Turquoise Blue FB is valuable for producing brilliant yellowish greens in combination with Durazol Yellow 6G, Durazol Yellow 4G or Durazol Flavine R. The brilliance of shade of the new dye makes it of special interest for dress goods and it is suitable for application to cellulosic fibres in all forms, including piece-goods on the jig and winch, and viscose rayon cakes and other yarn packages in circulating machines. Important secondary outlets for Durazol Turquoise Blue FB are on "Acrilan" and silk. On "Acrilan" it gives turquoise blue shades of good wet fastness and high light fastness properties. On silk it gives attractive bright greenish-blues of good wet fastness and light fastness.

Drill Grinding or Sharpening Machine



THE new Tartar drill grinding machine simplifies concentric sharpening of even the smallest twist drill. A projector-adjustment permits a twist drill to be re-sharpened in approximately 10 seconds, centring the drill also only takes seconds. Magnification on the projector system is from X10 to X60. After each pass across the grinding wheel, the drill is returned to a position in front of the viewing lens enabling a visual check to be made by the operator on the condition of the edge. By rotating the drill in its holder the operator can also check the concentricity of the drill.

No centring device is required when mounting the drill in its collet and only one collet is required for drills from $\frac{1}{64}$ to $\frac{1}{16}$ in. Right- and left-hand drills can be accommodated. The machine is made in two sizes for drills from $\frac{1}{64}$ to $\frac{1}{16}$ in. and $\frac{1}{64}$ to $\frac{3}{16}$ in. Lip angle 90° to 140°, clearance angles 0° to 30°. Further information concerning this new piece of equipment will be gladly supplied by Alfred Herbert Ltd., Coventry, sole agents for the machine.

Waterproofed Gummed Sealing Tapes

VITALOID PRODUCTS (MANCHESTER) LTD. have introduced the "Sealex" range of waterproof gummed sealing tapes for packing heavy containers and for goods intended for export; in fact, wherever an inexpensive but highly water repellent seal of great strength is required. These waterproof gummed tapes have been adopted by Burroughs Adding Machines Ltd., after exhaustive tests, for sealing cartons containing their well-known range of mechanised office equipment. Two layers of extra strong water-resisting kraft, laminated with a waterproofing medium and a specially formulated adhesive, are the basis of the "Sealex" range, which is available in coils of any width.

Apart from the high degree of water resistance, an interesting feature is that these coils can be used in any of the "Vitasealer" semi-automatic or manually-operated dispensers. "Sealex" No. 7 quality has a bursting strength of approximately 95 lbs. and No. 18, of 115 lbs./sq. in. (Mullen).

Special combinations can be made to order, including "treble Sealex," with two layers of waterproof medium and three layers of kraft.

Printing Acrylic/Cellulosic Fibre Unions*

ON blended fabrics of acrylic and cellulosic fibres—e.g., a "Courtelle"/cotton (67/33 type) or an "Acrilan"/viscose rayon (70/30 type) blended fabric—prints of good all-round fastness and solidity of shade are obtained by the use of selected Caledon and Durindone vat dyes. The recipe used is based on the conventional alkali carbonate-sodium sulphoxylate formaldehyde (all-in) receipe. The selection of the dyes to be used and the thoroughness of the washing-off process are of great importance if maximum fastness to rubbing is to be obtained.

* *With acknowledgements to I.C.I. Ltd., Dyestuffs Division.*

Recipe and Process

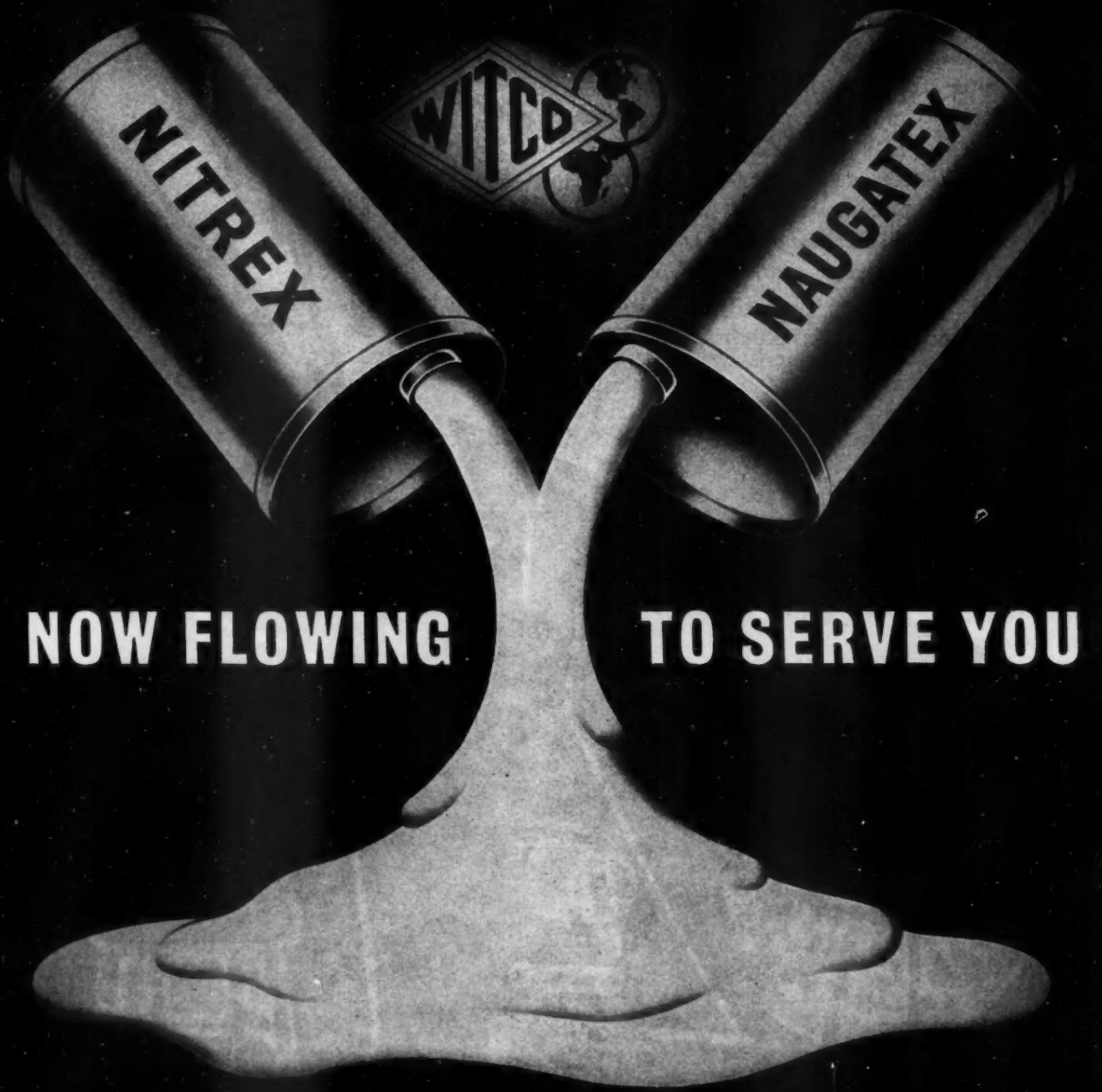
The general printing recipe is as follows:—

5 - 20 lbs. dyestuff paste are thoroughly stirred with 2 - 1 gall. thin neutralised thickening and then added with constant stirring to 6 - 5 gall. thickening in which has been incorporated 0 - ½ lb. glycerine, 5 lb. anhydrous sodium carbonate and 10 lbs. sodium sulphoxylate formaldehyde, bulked to 10 gall.

To assist in retaining the printed mark it is advisable to use a thickening of high solids content, such as Nafka Crystal Gum Supra (Scholtens, Groningen, Holland). Alternatively, an emulsion thickening may be employed. A reduction in the glycerine content of the print paste and the use of the less hygroscopic sodium carbonate in preference to potassium carbonate are recommended in order to prevent flushing of the print.

After printing, the goods are dried and steamed at atmospheric pressure. A steaming time of 10 mins. will generally be found adequate. In general, oxidation conditions more vigorous than those usually employed for 100% cellulosic fibres will be required. Treatment for 5 mins. in an oxidation bath containing 5 c.c. (¼ pint) of hydrogen peroxide (20 vol.) and 3 c.c. (¼ pint) of ammonia (sp. gr. 0·88) per litre (10 gall.) of water, maintained at a temperature of 90°C. (195°F.), is suggested. After oxidation, the prints are treated for 5 - 10 mins. at, or as near the boil as facilities permit, in a solution containing 2 parts of Lissapol ND per 1,000 parts of water, followed by a cold water rinse.

SYNTHETIC LATICES



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THE TEXTILE
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Making Wool a More Useful Fibre

Developments discussed include deposition of resin on the fibre, advantages of the newer scouring treatments, temperature effects, resistance to pilling, also problems met in the production of fast dyed mixture materials

By B. C. M. DORSET

AS a textile fibre wool has a unique combination of properties. In addition to softness, warm handle, resilience, extensibility, elasticity, resistance to abrasion, and excellent dyeing properties it also possesses felting properties of great value in finishing processes. Yet, in spite of the seemingly impregnable position of wool it is suspected that some useful type of wool substitute fibre will be produced in the future and because of this an ever increasing amount of research is being carried out on wool, sponsored by producers and users throughout the world. Results of current research in this field are striking and certainly indicate several new directions in which wool can be improved as a textile fibre.

There is a strong feeling that wool materials could have their wash-and-wear characteristics improved somewhat along the lines followed by cotton and rayon goods. To a large degree wool fabrics are naturally crush-resistant and this is a great natural advantage. But by contrast wool materials are liable to shrink; this is not so much by simple relaxation of temporarily fixed stretch but by a process of felting in which the fibres close up on each other progressively with continued or repeated washing until a much shrunken and thickened fabric results. Obviously, a wool material required to have the wash-and-wear characteristics of say a cotton or rayon material (after being specially resin finished) must in some way receive an anti-felt treatment. Again, wool fibres are somewhat sensitive to alkalis and particularly the caustic alkalis such as caustic soda, and this is a disadvantage. It is desirable that this sensitivity should be reduced.

Many processes are now available for making wool resistant to felting but all suffer some disadvantage. For example, the wool may be partly degraded during the treatment and lose some of its original durability or become harsh or yellow. On the other hand, the treatment may involve conditions disagreeable to the operatives. Hence the interest recently aroused in an Australian discovery that wool can be simply treated with an aqueous solution of potassium permanganate to give excellent resistance to felting without an appreciable adverse effect on the wool itself. It is recalled that hitherto it has generally been agreed that potassium permanganate solutions can only effect a moderate and insufficient anti-felting effect. Now it seems that if the potassium permanganate is applied from an aqueous liquor saturated with common salt (McPhee; J. Text. Research, 1960, **30**, 349 and 358) all the desired resistance to felting is obtained.

The new process for making wool non-felting and thus unshrinkable in washing consists of treating the wool material for about 30 mins. at room temperature (20°C.) in an aqueous liquor (ratio of liquor to wool 20: 1, and of pH 6·8 to 7·2, i.e., substantially neutral) containing 4% of potassium permanganate (calc. on weight of wool) also common salt to the point of saturation (not less than 24%). During this stage the wool becomes brown by deposition of manganese dioxide, MnO_2. This must be removed completely so that the wool acquires a good white colour in a second stage in which the wool is treated with 5% (calc. on wool) of sodium bisulphite in 0·25% sulphuric acid solution at room temperature for about 30 mins. Times of treatment in either stage can be reduced without appreciably affecting the result by raising the temperature moderately.

Table 1. Characteristics of Treated Wool

Concn. of common salt in liquor	Area shrinkage in washing test	Alkali-solubility	Bursting strength Dry	Bursting strength Wet	Whiteness
Untreated wool ..	40%	12%	114	86	46
0% at 20°C. ..	30 „	19 „	110	80	42
18% „ „ ..	9 „	20 „	108	80	45
24% „ „ ..	6 „	19 „	108	80	47
30% „ „ ..	5 „	18 „	108	80	47
30% „ 30°C. ..	6 „	18 „	108	80	47
30% „ 40°C. ..	5 „	19 „	108	80	47

In this process the presence of common salt makes an important contribution to the unshrinkable finish obtained, and another feature is that the sodium bisulphite treatment also makes the wool more shrink-resistant than it actually is immediately after the first stage of treatment with the potassium permanganate (such bisulphite treatment can lower the washing shrinkage by 7%). It has been determined experimentally that the best results for maintaining the original valuable properties (whiteness, softness, strength, etc.) are obtained by using a neutral solution of potassium permanganate rather than acid or alkaline solutions in spite of the fact that under such conditions oxidation of the wool takes place more easily. The data in Table 1 illustrating some of the statements made above, derive from trials along the lines described.

The alkali-solubility test is commonly employed to ascertain whether or not wool has suffered chemical damage and the rise from 12% to 18% indicated in the data is not excessive. The good retention of bursting strength and whiteness confirm the claim that wool does not suffer appreciably when treated with this potassium permanganate anti-felting process.

Another process based on the use of potassium permanganate for making wool shrink-resistant has been much used in recent years. The Dylan process uses an aqueous liquor containing no common salt but sodium hypochlorite. It is based on the observation that potassium permanganate alone does not produce a satisfactory degree of unshrinkability whereas a mixture of this oxidant with sodium hypochlorite does. In the Dylan process the wool becomes brown by deposited manganese dioxide and has to be whitened by a sodium bisulphite after-treatment. It may be suggested that it is just as convenient to use sodium hypochlorite instead of the high concentration of common salt but in making a comparison it must be remembered that the common salt liquor can be used repeatedly provided it is suitably replenished after each use.

Apparently the new potassium permanganate-common salt process has been tested out on a large scale in Australia with satisfaction and it has furthermore been demonstrated that the treatment is normally sufficiently even in its effect to allow the treated wool material to be dyed evenly. While the common salt is necessary to ensure that the oxidation of the wool with potassium permanganate gives a complete shrink-resistant finish it also functions as a wool protective agent. For instance, it allows higher concentrations of potassium permanganate to be inadvertently used without producing damaged wool. McPhee has also devised a somewhat similar anti-felting treatment in which a concentrated common salt liquor containing 1·5% of potassium bromate (calc. on wool) and 0·5% of sulphuric acid is applied for about 30 mins. at room temperature to the wool. A standing bath can be used. While the anti-felt result is satisfactory it is unfortunate that the wool is left with a somewhat harsher handle and requires to be treated with a softening agent.

These two new processes can be adapted to continuous operation in which the wool fabric enters the plant at one end to pass through the oxidation and bisulphite stages and emerge with its felting properties reduced or eliminated. One difficulty encountered in such continuous processing has been concerned with the wetting-out of the wool fabric with the oxidising (potassium permanganate) or potassium bromate liquor. The presence of the high proportion of common salt lowers the rate of wetting and most of the wetting-out agents added have rapidly decomposed and so lost their activity. Calsolene Oil HS (I.C.I.) has so far proved to be the most stable and convenient to use but it is not entirely resistant to attack by the oxidant.

Synthetic Resin Control

In the above methods for producing unshrinkable wool by treatment with potassium permanganate or sodium bromate + acid (bromine is liberated and it is this which attacks the wool to reduce its felting properties) adverse action on the wool is avoided by the protective action of a high concentration of common salt in the treating liquor. Some similar but not so complete protection is afforded by common salt when wool is treated with a hypochlorite solution. A recent discovery reveals that wool can be made non-felting by a treatment in which a hypochlorite liquor is applied to it following a pre-treatment with a plasticised or unplasticised resin in the form of an aqueous dispersion made with the aid of cation-active agent. It is especially important that this agent should be cation-active rather than anionic (B.P. 821,135). Under such conditions the resin containing wool absorbs the active chlorine from the hypochlorite completely and much more uniformly so that practically all the hypochlorite used takes part in giving the wool even non-felting properties.

Suitable synthetic resins for use in this process include polymethyl methacrylate, polybutyl methacrylate, poly-vinyl chloride, polyvinyl acetate, and urea- and melamine-formaldehyde resins which may or may not be plasticised with such plasticisers as dibutyl phthalate, di-octyl adipate (for polymethyl methacrylate) and di-octyl phthalate (for polyvinyl acetate), cation-active dispersing agents which have been found satisfactory include cetyl pyridinium bromide, cetyl trimethyl ammonium bromide, dimethylphenylbenzyl ammonium chloride, and tetradecyl pyridinium bromide. About ½ to 2% of the resin dispersion (assuming that it contains 40% to 50% of solid resin) is applied to the wool. A typical method of making wool half-hose unshrinkable by this process is as follows.

In a paddle dyeing machine 300 galls. of water at 70 to 75°F. is adjusted to pH 5 by addition of formic acid. Then 1 lb. of an aqueous dispersion of polymethyl methacrylate plasticised with dibutyl phthalate and containing 33% of total solids (the plasticiser content of these solids is about 40%) is added; the resin dispersion is prepared with the aid of cetyl pyridinium bromide. At this stage 100 lbs. of half-hose previously scoured with a non-ionic scouring agent and brought to pH 5 by a formic acid treatment are entered into the resin liquor and agitated for about 15 mins. to allow complete absorption of the resin.

The half-hose are then withdrawn and treated in a fresh liquor prepared with 8½ pints of commercial sodium hypochlorite solution (this contains 15% of available chlorine) and formic acid to bring the pH to 5. A treatment of 15 mins. is sufficient at room temperature to cause the complete absorption by the wool of the active chlorine and to make the half-hose shrink-resistant. An after-treatment in the same liquor to which 10 lbs. of sodium sulphite has been added destroys any residual active chlorine in the half-hose so that they can be washed-off and dried.

It is to be noted that by preparing the resin dispersion with a cation active agent the resin particles are given an electric charge opposite to that of the wool so that there is a strong attraction between the resin and the wool. In the chlorinating stage this resin acts as a levelling agent to ensure

that the wool is evenly attacked by the active chlorine.

Resin-finish to Make Wool Unshrinkable

Another method for giving wool unshrinkable properties so that it can have improved wash-and-wear characteristics depends not on a chemical treatment with a chlorinating or oxidising agent but on the deposition on the wool fibres of a resin. Probably this deposited resin lowers the difference of roughness of each fibre between the root-to-tip and tip-to-root directions. The success of this new method (B.P. 801,987) lies in the use of specially selected resins. These are made by copolymerising a preponderance of a monoethylenically unsaturated component such as an ester of acrylic and methacrylic acids with 3% to 15% of 4-vinylpyridine. Other vinylpyridine components such as 2-vinyl pyridine, 2-methyl-5-vinylpyridine, and 5-methyl-2-vinyl pyridine are useless for this purpose.

For a typical treatment, the special resin is prepared by copolymerising 90 parts of n-butyl acrylate with 10 parts of 4-vinyl pyridine (these components are emulsified in water with the aid of an octyl phenol-ethylene oxide condensation product) using (calc. on the weight of monomers) 0·3% of an ammonium sulphate catalyst, 1% of triethanolamine, and 0·6% of sodium hydrosulphite at 20 to 45°C. The resulting resin dispersion is diluted with water to give a 13·5% concentration. Wool flannel or other material is impregnated with the resin dispersion with a 75% liquor pick-up, dried within 10 mins. at 240°F., and further cured for 10 mins. at 300°F. After 5 hours' washing in a hot soap liquor the treated fabric was found to have zero shrinkage. Such an anti-felting treatment leaves the wool with its original softness of handle. Instead of the copolymer of n-butyl acrylate and 4-vinyl pyridine it is satisfactory to use alternative copolymers prepared from 92·6 parts of n-butyl acrylate, 5 parts of 4-vinyl pyridine, and 2·4 parts of methyl acrylate, or from 94·5 parts of n-butyl acrylate, 0·5 parts of methacrylic acid, and 5 parts of 4-vinyl pyridine.

Scouring of Raw Wool in Neutral Liquors

About 1935 suggestions were made that it might be advantageous to scour raw wool in neutral liquors making use of the non-ionic textile auxiliaries then becoming available in increasing numbers. For over a century it has been the usual practice to effect wool scouring with soap solutions to which a suitable proportion of soda ash has been added although it is generally known that in such scouring the alkali can adversely affect the wool by giving it a harsher handle, a lower tensile strength, a slight yellowing, and an increased sensitivity to become damaged during exposure to conditions harmful to wool. In those early days non-ionic detergents were expensive and less readily available and this could have hindered their large scale adoption for wool scouring at that time. But meanwhile these special detergents have become cheaper and their properties much improved. Thus it can be expected that they would repay a careful re-consideration for even in the early days of their application it was definitely proved that non-ionic detergents could leave the wool in better condition than when soap alkali is used for scouring. Olney and Ryberg (Amer. Dye. Rep., 1956, **45**, 781) have recently re-assessed the value of neutral wool scouring processes—in the laboratory and large scale—and have found it advantageous to replace older scouring methods by new ones operating at pH 7 or slightly below. They use non-ionic detergents, especially those of the alkylaryl polyethoxyethanol type, made by reacting an alkyl phenol with several moles of ethylene oxide. Such detergents are inert towards hard water and most acids and have a good emulsifying power towards the grease impurities found in raw wool. Olney and Ryberg first established the most suitable conditions of scouring with the non-ionic detergent Kyro EO and then tested out on the large scale the most favoured method on about 50 million lbs. of raw wools of various types.

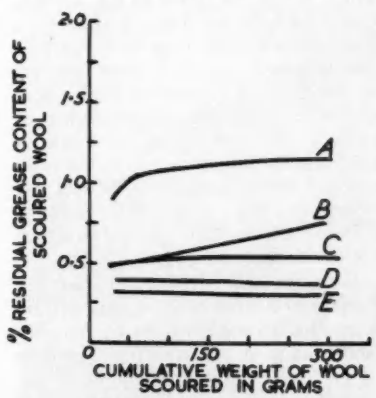


Fig. 1. Curves showing how the addition of various "builders" to the non-ionic detergent scouring liquor influences the efficiency of grease removal from raw wool (0·1% non-ionic detergent and 0·2% builder in scouring liquor with A—magnesium sulphate; B—urea; C—sodium dihydrogen phosphate; D—sodium chloride; E—sodium sulphate

The laboratory investigations revealed many interesting facts about non-ionic scouring. Raw wool generally has a high content of impurities and there may be 20% or more of natural fatty substances which normally have to be removed so as to leave not more than 0·50 to 0·75%. Simple washing with water aided by the suint present can result in a 50% purification of the wool. Preliminary experiments suggested that the washing liquor, using the customary 3-bowl type of raw wool washing machine, should contain approximately 0·1% of non-ionic detergent and it was then soon found that the efficiency of this detergent liquor could be much increased by having also a "builder" such as sodium sulphate or sodium chloride. The curves in Fig. 1 show how the degree of wool purification

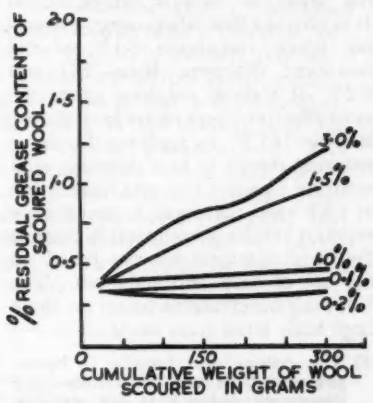


Fig. 2. Curves showing the efficiency of various proportions of sodium sulphate acting as a "builder" in a 0·1% non-ionic detergent scouring liquor used at 165°F.

expressed by residual grease content cannot be kept down to so low a value when other builders such as magnesium sulphate and sodium dihydrogen phosphate are employed. Since the scoured wool may have to be dyed and it is customary to use sodium sulphate rather than sodium chloride in the dyebath it is preferred to use sodium sulphate as the builder for the non-ionic detergent. Results of trials shown in Fig. 2 clearly indicate that 0·20% of sodium sulphate is the optimum proportion of sodium sulphate to be used with 0·1% of the non-ionic detergent. Higher proportions of say 1·5% and 3·0% impaired the scouring so that up to 1% and higher of grease could be left in the wool. This appears to confirm earlier observations by Hepworth (J. Soc. Dyers and Col., 1950, **66**, 101) and Zimmerman (Fourth Canadian

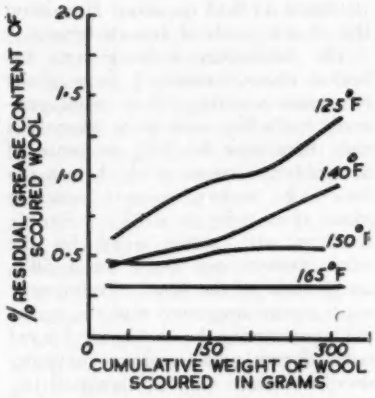


Fig. 3. Curves showing how the temperature influences the scouring efficiency of a liquor containing 0·1% of a non-ionic detergent and 0·2% of Glaubers salt as a builder

Textile Seminar Papers, 1954, p. 51).

Scouring temperature is important and Fig. 3 shows the results of scouring trials at various temperatures. It is obvious that when using a scouring liquor containing 0·1% of the non-ionic detergent Kyro EO and 0·2% of sodium sulphate cryst. the most effective temperature for scouring is about 165°F. In applying the above scouring results in four different wool scouring plants it was established that in each case non-ionic scouring gave superior results at comparable costs to the usual scouring process based on the use of soap and soda ash. The following observations based on these large scale trials were made:—

(1) The colour and handle is better preserved by use of a non-ionic detergent, since it is not possible to avoid some degradation of the wool in the older scouring process arising from the soda ash present.

(2) If the soda ash is omitted from the soap scour then arising from the use of hard water and the hydrolysis of the soap with preferential absorption by the wool of the soap alkali, the scouring liquor loses its detergent power and the wool is left with a higher proportion of impurities than can be tolerated in subsequent operations, particularly yarn spinning.

(3) If soap is used as a detergent then it is difficult to avoid the use of alkali to maintain the scouring efficiency; degradation of the wool must follow the addition of such alkali.

(4) Anionic detergents can be used instead of soap and have the advantage of being less sensitive to pH conditions and to hard water. However, such detergents are less efficient under neutral to slightly alkaline conditions which also favour their absorption by the wool with loss of detergent power. Hence an anionic detergent must be used with alkali to obtain the most satisfactory scouring results and then the wool will suffer degradation.

(5) Non-ionic detergents do not require alkali to maintain their scouring efficiency which is very satisfactory under neutral and slightly acid conditions. It is these conditions which best preserve the original qualities of the wool during the scouring process.

(6) Non-ionic scouring yields a wool which spins better than wool scoured with soap and soda ash; it is loftier and gives less noil in combing. Further, it usually has a noticeably whiter colour and dries much faster from a wet condition.

(7) The cost of scouring with a non-ionic detergent is comparable (sometimes less) with scouring by use of soap and soda ash.

The general conclusion of such investigations is that by adopting non-ionic wool scouring it should be possible to produce a better quality of wool and thus assist the production of superior wool textile goods.

Resistance to Pilling

Although the pilling of synthetic fibre materials has received considerable attention, it is a defect occurring in wool goods, especially in those materials made of soft spun yarns and somewhat loosely woven or knitted for extreme softness. Firmly constructed fabrics always pill less than those of an open nature since for pills to form on the fabric surface it is necessary for individual fibres to work their way partly out of the fabric to allow their protruding ends to matt together in the form of fibre tufts or pills. Such migration of the fibres is much hindered if the yarn of which the fabric is made is hard spun with the fibres tightly twisted together.

Pilling primarily arises from abrasion of the wool material since it is this which works the fibres to the surface. Once the pills are formed then fibre strength plays an important part in deciding how long they resist removal as the result of further abrasion. It is generally agreed that the number of pills on the surface of the fabric is governed by the difference in the rates at which the pills are being formed and being removed. A low fibre strength is favourable to pill removal during the use of the fabric.

From the above it is evident that the liability of a wool fabric to pill can be controlled to some extent by suitable modification of the fabric in respect of its behaviour to abrasion during wear. According to B.P. 823,048 this modification may be obtained so that pill formation is lessened by treatment with a liquor containing a condensation product of an aromatic sulphonic acid with formaldehyde and a non-ionic dispersing agent, or a water-repellent liquid silioxane at a temperature between 150°F. and 212°F. A large number of these agents are available under various trade names.

The non-ionic dispersing agents favoured are generally of the type indicated by the general formula shown in Fig. 4, where R is an alkyl group

$$R\text{-}O\text{-}(CH_2CH_2O)_n\text{-}H$$

Fig. 4

preferably containing more than eight carbon atoms and n is an integer preferably greater than 20. Such agents are produced by reacting a fatty alcohol with ethylene oxide. Other non-ionic agents conform to general formulae given in Fig. 5, in which R and n have the same meanings as given above. Thus the suitable dispersing agents known as Dispersol VL and Lubrol W and sold by I.C.I. Ltd. are fatty alcohol-ethylene oxide condensation products while Zelec DP (du Pont) is a higher polyethylene amine condensate.

Water repellent liquid polysiloxanes which have proved satisfactory contain one or both of the types shown in Fig. 6, in which the main difference lies in the number (one or two) of methyl (CH_3) groups attached to each silicon atom and the number of recurring siloxane units in each molecule. Such polysiloxanes as Drisil 105 are usually applied together with a catalyst such as Catalyst N21 (both sold by Midland Silicones Ltd.) so that the polysiloxane finally left in the fabric is further polymerised than when applied.

Many condensation products of aromatic sulphonic acids with formaldehyde are available and they include dinaphthylmethane-, diphenylmethane-, dicresylmethane-, and dinitronaphthylmethane- disulphonic acids. Some may contain three or more sulphonic acid groups (SO_3H) in their molecule. Irgasol DA (Geigy) is of the type (Fig. 7).

$$R\text{-}CO\text{-}O\text{-}(CH_2CH_2O)_n\text{-}H$$
$$RCO\text{-}(CH_2CH_2O)_n$$
$$H_2N(CH_2CH_2NH)_nH$$

Fig. 5

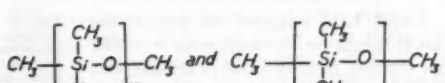


Fig. 6

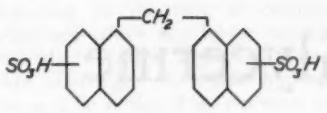


Fig. 7

The general principle of this treatment to make wool materials less liable to pilling is that of working the material in a hot bath containing the ingredients specified above; at least ½% of the condensation product of an aromatic sulphonic acid with formaldehyde and at least 1% of the non-ionic dispersing agent or the water-repellent liquid polysiloxane. It is often convenient to dye the wool goods first and then in a fresh bath immediately treat with the anti-pilling ingredients. The following typical example illustrates such a treatment. The bath is first prepared to contain:—

870 c.c. of water
0.87 grams of 80% acetic acid
2·9 grams of Glaubers salt
0.29 grams of Irgasol DA (Geigy)
0·46 grams of Drisil 105 (Midland Silcones Ltd.)
0.12 grams of Catalyst N21 (Midland Silicones Ltd.)
and also the following dyes—
0·058 grams of Xylene Fast Yellow P (Sandoz)
0·058 grams of Erio Fuchine BBL (Geigy)
0·029 grams of Coomassie Blue BL 200% (I.C.I.)

Then 29 grams of knitted wool fabric are entered into the bath at 100°F. which is raised to the boil and dyeing continued until a solid blue shade is obtained. When the dyed wool fabric was tested for pilling in a Martindale testing machine (in this the fabric is subjected to an all-over rubbing against an abrasive surface which may be another or the same kind of fabric) it was found that it required 36 rubs before pilling resulted whereas only 21 rubs were required to commence pilling when untreated wool fabric was tested.

When it is desired to use a non-ionic dispersing agent instead of the liquid water-repellent siloxane another type of treatment is recommended. The bath is first prepared to contain:—

765 c.c. of water
0·5 grams of 80% acetic acid
0·25 grams of Irgasol DA (Geigy)
2·5 grams of Glaubers salt
0·25 grams of Zelec DX (Du Pont)
and also the following dyes—
0·05 grams of Zylene Fast Yellow P (Sandoz)
0·02 grams of Erio Fuchine BBL (Geigy)
0·05 grams of Coomassie Blue BL 200% (I.C.I.)

Then 25·5 grams of knitted wool fabric are entered into the bath at 160°F. and the temperature is raised to the boil and dyeing continued until the dyes are exhausted from the bath.

A fresh bath is then made up with 765 c.c. of water containing 0·75 grams of Avitex FB (this has the effect of insolubilising the Zelec DX in a controlled manner and so that this is evenly deposited on the wool fabric).

The dyed fabric is worked in this fresh bath at 120°F. for about 20 mins. and then rinsed, withdrawn and dried. Using the Martindale tester showed that the resulting wool fabric required 35 (against 21 for the untreated fabric) rubs to commence pilling. This same treatment can be applied to nylon goods to secure the same beneficial results.

Production of Fast Dyed Mixture Materials

A difficulty encountered in producing satisfactory coloured materials containing both wool and polyacrylonitrile fibres is that of dyeing the same shade on both fibres, since it is well known that this type of fibre is reluctant to absorb many of the dyes easily applied to wool to give fast shades. Recently progress has been made in producing modified polyacrylonitrile fibres so that they have wool-dyeing properties and, in fact, absorb some wool dyes equal to wool itself. In particular, the important discovery has been made (B.P. 830,634) that if the polyacrylonitrile fibre contains about 10% of polyvinylpyrrolidone having the formula set out in Fig. 8, then it has a very useful affinity for the neutral-dyeing pre-metallised dyes now finding considerable applicable for dyeing wool in fast

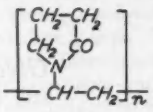


Fig. 8

shades. These particular dyes differ from the earlier discovered pre-metallised dyes in containing only about half the amount of cobalt, chromium, or other metal in the complex dye, also in the fact that they can be applied under substantially neutral conditions in contrast to the strongly acid conditions (liable to harm the wool) demanded by the earlier dyes.

With this new type of modified polyacrylonitrile fibre it becomes possible to dye—by a one-bath process—fast shades on mixture goods containing both wool and polyacrylonitrile fibres using in the dyebath only the neutral-dyeing pre-metallised dyes under conditions which tend best to preserve the original valuable properties of the wool (strength and softeness of handle) and yet obtain about the same shade on both types of fibre.

Miles of Dexion in Mail Order Stores

Over sixteen miles of Dexion slotted angle and 19,000 steel shelves are helping to speed service at Littlewoods new mail order stores at Bolton. The stores which handle everything from electrical equipment to hardware, fancy goods and clothing are in Dove Mill, Deane (formally a well-known cotton spinning firm), and cover nearly a third of a million square feet. The Dexion units were built by the firm's own staff in six working weeks.

Novel Applications of Glycerine and its Compounds

Glycerine and glycerine compounds find steadily increasing use in the textile and allied industries. Forming the basis for some finishing processes—including crease-resist—it has many applications in dyeing and printing, anti-static treatments, water repellents, flameproofing, etc., and in fibre spinning baths

By G. MACHELL, B.SC., PH.D.

GLYCERINE, more properly known as glycerol, is a by-product of two important process industries—soap making and fat splitting—and is now also being synthesised from propylene. It is a trihydric alcohol, i.e., it contains three hydroxyl groups (OH), which can take part in chemical reactions leading to the formation of esters and ethers (see Fig. 1). All the glycerine compounds mentioned in this account fall into one of these groups, and in some cases into both. In the past glycerine and its compounds have found their greatest application in dyeing and printing, but the most important recent developments have taken place in the field of finishing, which is therefore considered first.

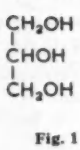


Fig. 1

Finishing Processes

During the past twenty years, an enormous amount of effort has been directed towards the perfecting of crease-resist finishing for cotton, regenerated cellulose and linen. The disadvantages of the urea- and melamine-formaldehyde resins—objectionable odour of the finished fabric and chlorine retention on hypochlorite bleaching—are well known, and may be partly overcome by replacing the urea with other nitrogen compounds. However, a complete solution of these problems would seem to require the development of a composition which is not based on formaldehyde, and which is free from "active" hydrogen atoms, such as those directly attached to nitrogen atoms.

A most promising advance along these lines has been the devising of a crease-resist process based on di-epoxides produced from glycerine and epichlorhydrin.[1] Some practical details of this process are given later, but first it is of interest to outline the chemistry involved in the process. The reaction of glycerine with epichlorhydrin in the presence of a catalyst, followed by the removal of the elements of hydrochloric acid, yields essentially the diepoxide shown in Fig. 2.

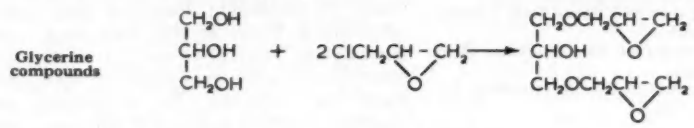


Fig. 2

It is known that under the influence of a catalyst—caustic alkali, tertiary amine or mineral acid—the epoxide group in an organic compound will react with a hydroxyl group in a second compound as shown in Fig. 3.

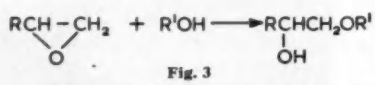


Fig. 3

The cellulose molecules in cotton, etc., are bristling with these hydroxyl groups, which are capable of reacting with epoxides as above. To obtain crease resistance, it is necessary to link together adjacent cellulose molecules, and clearly this cross-linking can be brought about by using an agent containing two epoxide groups, that is the diepoxide prepared from glycerine. This cross-linking process is depicted in Fig. 4. Of course, this is an idealised picture; not all of the diepoxide would be used in cross-linking, some being "lost" in linking together two hydroxyl groups attached to the same cellulose molecule for instance.

In practice, an aqueous solution of the diepoxide mixed with a catalyst is applied to the fabric in the conventional manner. After drying, the fabric is cured at 160° for 5 min. and then washed. The final material has a soft handle, and excellent resistance to creasing and washing shrinkage. A comparison of the crease resistance and tear-strength of the treated fabric with that of fabric treated with urea-formaldehyde favours the diepoxide treated material. The latter also shows

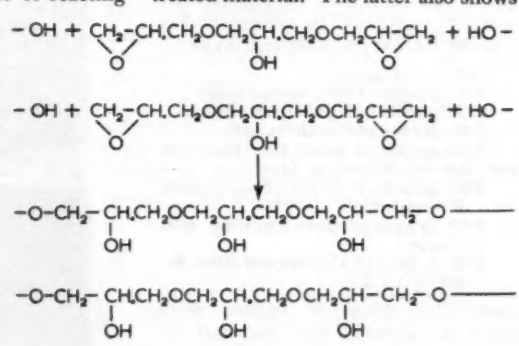
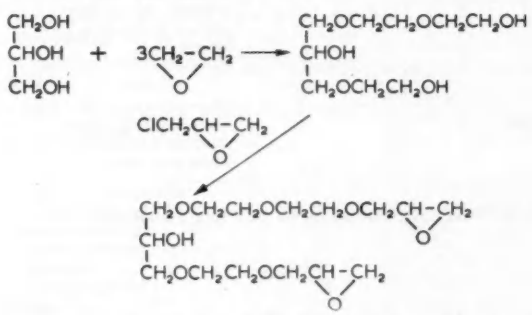


Fig. 4. Idealised picture of the cross-linking process

virtually no chlorine retention and the treatment is resistant to washing, properties which are to be expected from the chemical structure present. Thus there are no active hydrogen atoms to be replaced by chlorine, and as the cross-links are built up from carbon to carbon and carbon to oxygen bonds only, they are not susceptible to hydrolysis in washing.

Other related recent developments have included a composition made up from the above diepoxide and dimethylolethyleneurea, which is said to give an outstanding crease-resist finish to white cotton.[2] A second composition—diepoxide with rubber latex[3]—is applied as an aqueous emulsion, and gives a fabric of even higher tensile strength and tear resistance. A further application for the latter composition has been suggested in the motor tyre cord field. The adhesion of rubber to rayon and nylon is improved by impregnation of the fibre with diepoxide-rubber, and the treated cord has a considerably enhanced tensile strength.[4] This diepoxide from glycerine would also seem to have a future in wool treatment, for it has been shown that the shrinking and creasing of woollen textiles is reduced, and the water repellency improved, by treatment of the fabric with aqueous emulsions of this compound.[5]

The reaction of epichlorhydrin with certain glycerine compounds also affords polyepoxides of value in crease- and shrink-resist finishing. One glycerine compound of interest in this connection is a glycerine-ethylene oxide condensate,[6] which is prepared by treating glycerine with ethylene oxide in the presence of sodium hydroxide as catalyst. This gives polyethers of the type shown, which are then treated with epichlorhydrin, the final product being essentially a diepoxide as before (see Fig. 5).



(right) Fig. 6. The product obtained from monostearin

(left) Fig. 5. The final product is a diepoxide

However, the presence of more ether linkages in the diepoxide results in a superior final finish.

Leaving the subject of epoxides from glycerine, we come to a survey of other potential applications of glycerine and its compounds in finishing processes. To take an example of the use of glycerine itself first, it has been recommended[7] as a constituent of a finish for polyamides. Nylon fabric is padded with a solution containing ammonium polyacrylate and glycerine in water, and after drying at 150° for 30 min., the fabric is washed. The material has a stiff, crisp finish which is resistant to washing and some solvents, such as white spirit.

Glycerine borate may be used as a catalyst in the application of urea-formaldehyde and similar resins in crease-resist finishes.[8] Glycerine formals—compounds formed between glycerine and formaldehyde—may replace formaldehyde itself in crease-resist compositions based on bis-(hydroxymethyl)-ethyleneurea.[9] The condensate of urea-formaldehyde with glycerine serves as a felt-proofing agent for wool.[10]

The monoglycerides of fatty acids have been the subject of increasing commercial interest in the past few years. These compounds are prepared by treating fats—triglycerides—with a large excess of glycerine in the presence of an alkaline catalyst. Monoglycerides have been converted into numerous compounds of value to the textile industry. Their sulphosuccinates are prepared by reacting them with fumaric acid and then with alkali sulphite; the product obtained from monostearin, for example, has the formula given in Fig. 6. Such compounds are used as textile softening agents and as plasticizers for starch-sized fabrics, and have the advantage of being non-yellowing.[11]

Treatment of monoglycerides with appropriate amounts of dibasic acids such as adipic acid affords alkyd resins, which have been used for some years in coating compositions for textiles. One of the latest developments along these lines involves further reaction of the alkyd resin with epichlorhydrin to give an epoxide, which is mixed with styrene and then cured on the fabric.[12]

Polyurethanes constitute one of the most recently developed groups of organic polymers, and are well known as foams. Polyurethanes are often based on glycerine, and are being evaluated for textile applications. In one process, glycerine is first combined with a dibasic acid, such as adipic acid giving a polyester containing free hydroxyl groups. This is then mixed with a diisocyanate—tolylene diisocyanate is suitable—and a solution of the mixture padded on to the fabric. Subsequent heating at about 125° results in cross-linking at the free hydroxyl groups as shown in Fig. 7. Treatment of polyester fabrics, such as "Terylene" by this process gives a finished fabric which drapes well, and

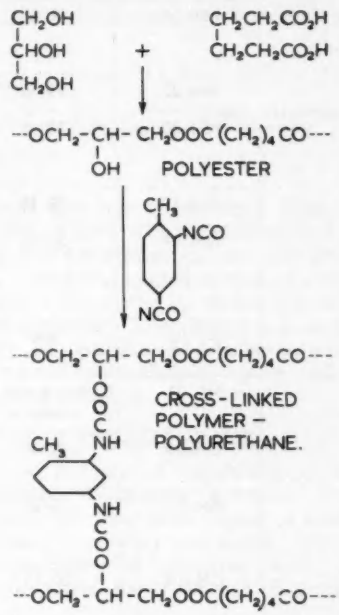
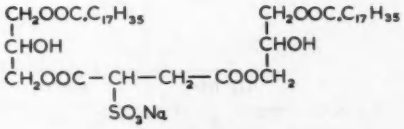


Fig. 7. Cross-linking at the free hydroxyl groups



which has a very high electrical breakdown voltage.[13]

Dyeing and Printing

Glycerine has long been employed as an assistant in various dyeing procedures, and features in a recently announced process known as fluid-bed dyeing. This procedure, developed in the laboratories of the British Rayon Research Association, is still in the experimental stage, but has already yielded some promising results.[14] A

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NH–22	45–55	,,	,,	,,	,,	do.
NH–20	35–45	,,	,,	,,	,,	Textile sizing, Paper coating, adhesives, films
NH–17	25–35	,,	,,	,,	,,	do.
NM–14	20–25	,,	,,	,,	,,	Paper coating, Moulded products Temporary protective coating
NL–05	4–6	,,	,,	,,	,,	Ceramics, Textile finishing
NL–03	Too low to measure	97–99	10 max.	,,	,,	Paper coating, Textile finishing
GH–20	35–45	86–89	5·0 max.	,,	,,	Mouldings, extrusions
GH–17	25–35	,,	,,	,,	,,	Textile sizing, Emulsifying agent, Stencil screen, extrusions
GM–14	20–25	,,	,,	,,	,,	Film, Emulsifying agent, Stencil screen remoistenable adhesives
GL–08	8–13	,,	,,	,,	,,	Ceramics, Remoistenable adhesives, Textile sizing, Temporary protective coating
GL–05	4–6	,,	,,	,,	,,	do.
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fluid bed is in essence a metal container filled with sand or tiny glass spheres, this material being fluidised by the passage of a rapid stream of air upwards through the bed. Wet fabrics can be dried rapidly and evenly at a controlled temperature by passing them through the heated bed.

The process has also been adapted for dyeing most types of fabric including those woven from the hydrophobic fibres cellulose acetate, nylon and "Terylene." These are dyed with disperse acetate dyes using a dyeing medium consisting of a dispersion of the dye in water containing a wetting agent and a dyeing assistant. Several assistants have been investigated, but glycerine appears to give the most satisfactory results and is employed to the extent of about 5% by volume in the dye liquor. The fabric is padded with the dispersion, and then passed through the fluid bed at about 190-200°C., with a residence time of 10-30 secs. Under these conditions, moisture is rapidly and evenly removed, and the dye fixed on the fabric. In the same way glycerine has been employed as an assistant in the experimental fluid-bed dyeing of "Terylene," nylon and triacetate fabric with azoic dyes. The exact function of the glycerine in this process is not clear, but in its absence the uptake of dye by the fabric is much lower.

Fibres, textiles and bristles prepared from linear polyesters such as "Terylene," which have been dyed in the melt with vat or amino-anthraquinone dyes, have improved fastness to boiling water and hot acids and alkalies as a result of treatment for 20 to 30 min. with a boiling, aqueous solution of glycerine.[15]

Glycerine has always been a popular constituent of printing pastes, where its hygroscopicity, solvent power and low volatility are particularly useful. It has recently received mention[16] as a component of printing pastes for white and colour discharge printing on polyester fibres by the thermosol method. A paste for white discharge printing consists of:—

	Pts.
Zinc formaldehyde sulphoxylate	300
Gum thickener, 1: 2 ..	280
Hydroquinone	50
Glycerine	100
Pentaerythritol	50
Water	100
Carrier	100
Optical bleaching agent ..	20

The printed fabric is dried and fixed at 200° for up to 3 min., then, after thorough washing, it is reduced with hydrosulphite. This process does not affect the physical properties or the handle of the fabric and is applicable to a wide range of vat dyes.

The diepoxide prepared from glycerine and epichlorhydrin has been used[17] in the treatment of acrylic and polyester fibres to improve their receptivity to conventional dyes and pigments. This diepoxide is applied as an aqueous emulsion containing also diethylenetriamine to cure the epoxide, and the treated fabric then cured at 160°. As well as conferring excellent dye receptivity, this process affords a fabric with a soft hand and free from pilling.

Glycerine triacetate, more generally known as triacetin, is made by treating glycerine with acetic anhydride as shown in Fig. 8.

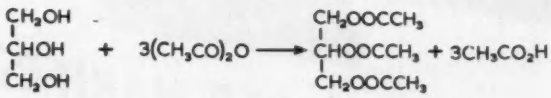


Fig. 8. Glycerine triacetate

Triacetin may be employed in the fixing of dyes on to the relatively new cellulose triacetate fabrics. Thus a fabric woven from triacetate filament yarn may be printed with a composition containing azo dye, triacetin, methylated spirit, printing oil and methylcellulose, and subsequently steamed at 220°F. for 60 min.[18] Acrylic fabrics may be printed or dyed with a paste or padding liquor containing an anthraquinone dye, triacetin, British gum, copper sulphate, finely dispersed copper powder and tartaric acid.[19]

Anti-Static Treatments

Glycerine itself and monoglycerides give anti-static finishes on nylon and other hydrophobic fibres, the mono-glyceride being superior. The effectiveness of the mono-glyceride depends in turn upon the nature of the acid group it contains, increasing from acetyl up to stearyl. Presence of unsaturation in the acid group reduces the effectiveness; thus glycerine mono-oleate is less effective than the mono-stearate.[20]

Conversion of monoglycerides to sulphosuccinic acid derivatives, described in an earlier section, is the first step in the production of a different type of anti-static agent. The product is mixed with an inorganic salt, such as calcium chloride or magnesium nitrate, whose crystal growth it inhibits. This composition prevents the accumulation of static charges on acrylic fibres, wool and cellulose acetate.[21]

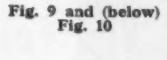
A glycerine-ethylene oxide condensate also has good anti-static properties, but is improved either by mixing it with a dodecyl alcohol-ethylene oxide condensation product,[22] or by treating it with lauric or stearic acid to obtain an ether-ester.[23]

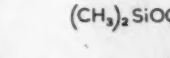
Although many of the glycerine based anti-static agents are effective in enhancing the electrical conductivity of materials such as nylon, "Terylene," "Orlon," etc., and thus reducing fire risks and difficulties in the mechanical processing of such fibres, they are more or less readily removed from treated fabrics on washing. Consequently, there has been an intensive search for more permanent treatments which would be capable of withstanding laundering and dry-cleaning. One such new type of anti-static finishing agent is formed on the material by first padding it with an aqueous solution of a polyhydric alcohol such as glycerine and a copolymer of methacrylic acid and styrene. After drying and curing at 130°, the finish is resistant to washing and to dry-cleaning agents such as trichlorethylene.

Water Repellents

A number of organosilicon and similar compounds produced from glycerine have been found to confer water repellency on textile fabrics. Treatment of glycerine with the compound shown in Fig. 9 gives a

Fig. 9 and (below) Fig. 10





useful polymer[24] of general formula shown in Fig. 10. A second composition is made from an aqueous emulsion of a silicone resin and an ester of titanic acid with glycerine.[25] The latter is prepared from glycerine and titanium tetrachloride.

Flameproofing

Certain textiles have recently received much adverse publicity owing to their extreme inflammability, and this has stimulated the search for an effective flameproofing treatment for these materials. The reaction of

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glycerine with aziridinylphosphine sulphide affords a product, which can be padded on to such fabrics. On drying at 140°C. in air, this product polymerises in the fibres to give a polymer containing phosphorus, nitrogen and sulphur, which is highly flame resistant and resistant to washing.[26]

Miscellaneous Applications

At one time, glycerine was a constituent of the acid spinning bath used in the manufacture of viscose rayon; more recently, a glycerine-ethylene oxide condensate has been recommended[27] for the same purpose. The presence of this condensate is said to result in less filament breakage and more uniform filament size. Colourless cellulosic fibres having a reduced swelling in an aqueous medium are prepared by treatment of viscose before spinning with a polyester produced from glycerine and adipic acid.[28] The product is then extruded into an acid bath in the usual way, and the fibres formed impregnated with an aqueous solution of formaldehyde and ammonium chloride, followed by drying at 80 to 85°C.

Glycerine may be used in the spinning of acrylic fibres. A solution of polyacrylonitrile in dimethylformamide is spun into a bath of glycerine, in which the polymer is insoluble. In a second process[29] the polymer solution is extruded into a coagulating bath containing a 35% solution of potassium carbonate at 40°C. The resulting filaments are washed, dried, and then stretched to five times their original length in a bath of glycerine at 150°C.

When cellulose triacetate is immersed for a short period in a bath of glycerine at about 150°C., the safe ironing temperature is increased from 180° to 250°C. In addition, the treated material has a good glazing resistance and a shrinkage of less than 2%. Incidentally, the fabric may be dyed at the same time by incorporating in the glycerine bath a dispersed cellulose acetate dye of the high temperature, slow dyeing type.[30] This recalls the use of glycerine as an assistant in the fluid-bed dyeing of the same fabric.

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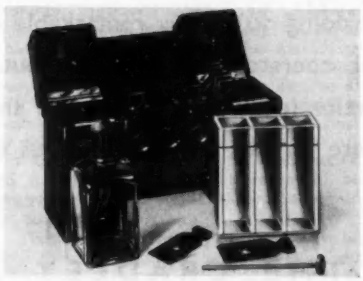
Rapid Measurement of pH

THE increasing use which is being made of the pH value as a means of control of acidity and alkalinity has given rise to the need of a method whereby the analyst or industrial chemist can quickly and accurately determine this active acidity and alkalinity in the materials being processed. This is now possible with the Aquascope, a portable instrument, manufactured by Paterson Engineering Co. Ltd., 129 Kingsway, London, W.C.2, which makes use of the fact that certain reagents (indicators) change colour in the presence of acid or alkaline solutions. The Aquascope consists of a plastic moulding carrying a "Perspex" three-cell sampling unit arranged to permit the sample to be viewed through observation windows in front. The three compartments of this unit are filled to the level indicated by a black line with the liquid to be tested and the indicator solution is added to the central cell by a graduated pipette provided. After stirring, the colour produced is matched by inserting the appropriate colour slides in front of the two end cells which contain the liquid only. The nearest colour to that developed in the central cell is a measure of the pH of the sample under test.

The set of colour slides consists of nine permanent colour standards mounted in moulded slides of a shape convenient for manipulation, which are arranged in the right hand compartment in two rows banked for easy access. The pH value is engraved on the top of each slide and the appropriate indicator on the side.

The standard indicator supplied is Brom Thymol Blue which has a range from pH 6·0 to 7·6 in steps of 0·2. Should



The Patterson "Aquascope"

the colour produced be intermediate between that of two consecutive slides, the pH can be expressed as an intermediate value, e.g. 6·9, 7·1, etc. This range, which represents a variation from slight acidity to faint alkalinity is adequate for testing most natural waters but should the pH indication of a sample be either 6·0 or 7·6, a further test should be made with other indicators in order to determine how much below or above these figures the actual pH value is. A selection of indicators and standard colour slides for testing samples of an acidity up to 4·4 or an alkalinity up to 10·0 may be obtained.

If chlorinated water is being tested a crystal of sodium thiosulphate should be added to destroy the chlorine before adding the indicator solution, as the chlorine may bleach or change the colour of the indicator. Hard waters which are corrosive owing to an excess of free carbon dioxide or soft waters containing organic acids in addition to free carbon dioxide, can be neutralised by the addition of an alkali. Lime is the alkali generally used for such waters and to simplify the test a special "Lime Type" Aquascope is available.

• • •

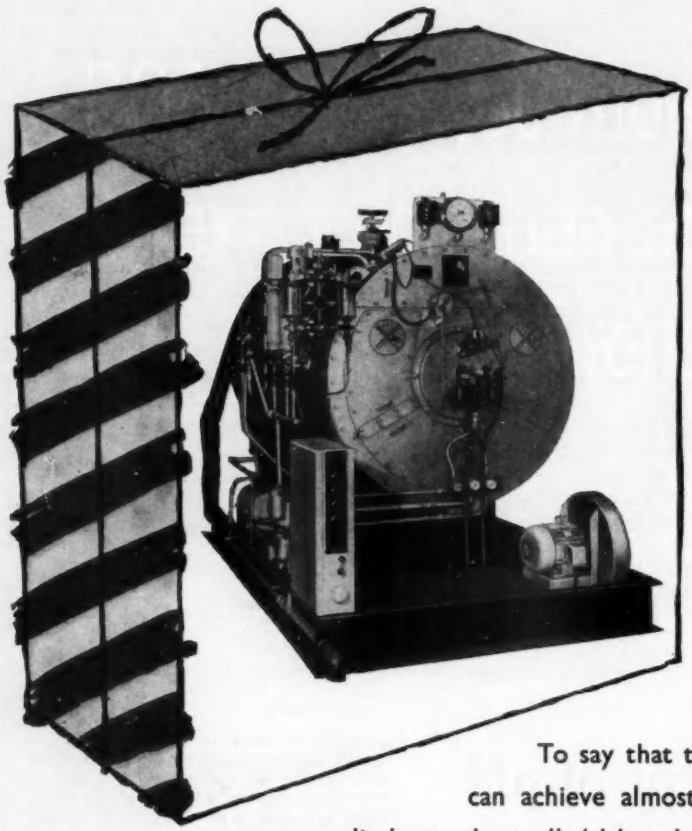
Textile Institute Honours

Council of the Institute has resolved that the status of Companion Member be granted to Mr. F. C. Bagnall, C.B.E. (managing director, British Nylon Spinners Ltd., Pontypool), Mr. N. G. McCulloch, C.B.E., F.S.D.C., (deputy chairman of the Calico Printers' Association, until he retired and former chairman of Council of the British Cotton Industry Research Association); Mr. W. R. Wadsworth, O.B.E., J.P. (managing director, Wm. Frost and Sons Ltd., Macclesfield).

• • •

Faster Shades on Wool

Dispersol CWL, a new dyeing assistant announced by I.C.I. Dyestuffs Division, is a pale fawn liquid, essentially non-ionic, which functions by slowing down the rate of dyeing of acid milling dyes of the Carbolan and Coomassie types. Many of these, such as Carbolan Violet 2R, that have hitherto been considered unsuitable for level application to wool yarns, can now be applied completely satisfactorily. Others, including the majority of the Carbolans, can be applied at a higher initial dyeing temperature, thus saving time. In many cases, piece goods can now be dyed satisfactorily with acid milling dyes with the aid of Dispersol CWL. Auxiliary products literature No. 131, from Dyestuffs Division, gives full details on the use of Dispersol CWL and classifies the I.C.I. acid milling dyes according to their amenability to control by its use.



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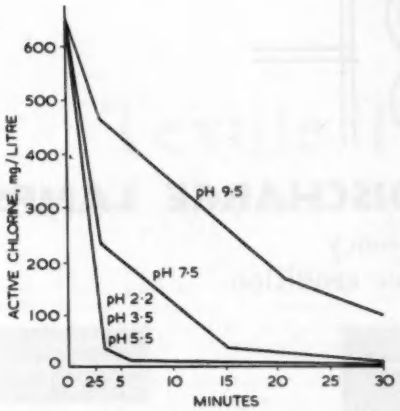
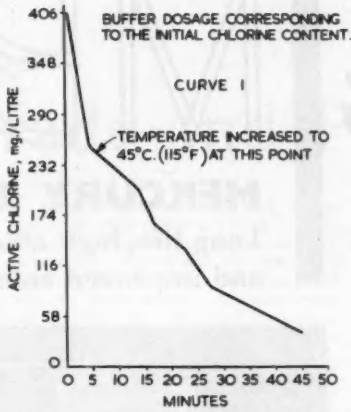
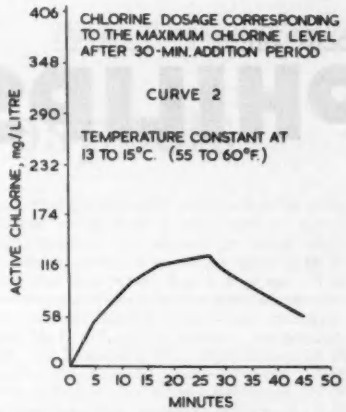


Lower the pH of the bath and faster is the chlorine absorbed



Bath effectiveness is quickly reduced if the chlorine is all added at once



Effectiveness stays high if the chlorine is added continuously

Key Controls in Shrinking Wool*

PRIMARY cause of shrinkage in woollen fabrics or yarn is the tendency of wool fibres to felt and felting is the result of movement of the fibres within the yarn or fabric. This movement is almost entirely in the direction of the hair roots. The scaly surface of wool fibres acts as a non-reversible locking mechanism that prevents motion of fibres past each other except in the one direction. Granted, other factors, such as the elastic properties of wool fibre, play a part in the wool-felting effect. Yet the primary cause remains in the one-way surface roughness, characteristic of wool.

A very effective method of reducing the tendency of wool to shrink lies in removing the scaly surface by oxidation with acidic solutions of chlorine. But the reaction is extremely rapid at low pH and relatively ineffective at high pH. So a buffer must be used if the desirable characteristics of the fibre are to be retained after the scaliness has been reduced. If chlorination is properly carried out, the hand, colour, and dyeing properties of the fibre will be retained, but too-rapid chlorination may produce a weak, harsh fibre that does not dye evenly.

The shrinkage occurring when woollen fabrics are first wetted after manufacture is often caused by mechanical stretching in spinning or weaving. This type of shrinkage cannot be overcome by chlorination, but it should be kept to a minimum by proper manufacturing processes.

How Wool may be Chlorinated

Three basic processes of chlorination have been successful. Two of these are dry processes. In one, gaseous chlorine is applied to damp wool in a closed chamber. The other process depends on solvents carrying chlorine-bearing chemicals to the wool. The latter method also requires a closed system for the reaction; the solvent must be recovered for economic reasons.

A number of patented processes have been developed for producing low-shrinkage wool. These include the Stevenson-B process, which uses a combination of hypochlorite and permanganate; and the Lanfix process, which depends on copper salts and H_2O_2. Both depend on oxidation. Others in use are processes depending on alcoholic potash, enzymes, latices, resins, and cross-linking reactions with epoxy compounds and aldehydes.

A simple method is to treat the wool in ordinary dyehouse equipment with a suitably buffered solution of chlorine. Sodium hypochlorite is the usual source of chlorine for the process. The maximum anti-felting effect is produced by solutions containing 1 to 2% available chlorine at pH 2 but, as is shown in the illustration, under these conditions the absorption rate of chlorine by the wool is nearly instantaneous. Any commercial operation carried on under these circumstances would be impractical because uneven results would be almost certain.

The ideal chlorinating solution must be so balanced to do its work quickly and affect only the scaly surface of the fibre as evenly as possible. This type of reaction is brought about by adding a chlorine acceptor to the chlorinating bath. The acceptor combines with the chlorine to form chloramines, which in turn decompose and release the chlorine to the wool. The reaction is thus slowed down so that the acid chlorination process becomes practical. Wool can be successfully chlorinated in any one of several forms, from slubbing to piece goods, including packaged yarn. A basic formulation that can be applied to wool in any form follows:

Pretreatment: Set a bath with a liquor ratio of 25 to 40 to 1, preferably with softened water, and at a temperature of 50 to 68°F. Wash the wool for 10 min. in this bath, to which has been added 1 to 2% Chloregal D (Geigy) followed by 2½ to 3 pints of 66° Be sulphuric acid per 100 lbs. of wool. Hydrochloric acid (30%) can be substituted for sulphuric acid at a rate of 7 to 8% on the weight of the wool. Next, add 1 to 3% active chlorine over a 30- to 60-min. period, and treat the goods for a total of 1 hour; pH 2 is normal for the pretreatment bath and this will rise to pH 3 during the chlorination. The residual chlorine in the bath after 1 hour should be 8 to 15% of the total added.

Antichlor: To the chlorinating bath add 1 to 2% owg. sodium bisulphite, or 1 to 2% sodium thiosulphate. Work for 10 to 15 min. If goods are to be dyed, 2 to 3% hydrogen peroxide can be added to the neutralizing bath to follow. Dyed wool should be rinsed after antichloring in two fresh baths for 10 min. each. Wool to be dyed should be neutralized after antichloring in a fresh bath containing 3 to 4% ammonia and 2 to 3% H_2O_2. Dyed wool may be finished off with 0·5 to 1·0% of a nonionic softener.

The chlorine may be added to the bath in one portion. But this method requires large amounts of buffer, and the buffer tends to absorb the chlorine too effectively. One must take care in the later stages of the process to ensure the transfer of the chlorine to the wool, and that is why good control of the process is so essential. The simpler way is to add the chlorine at a controlled rate of flow. Less buffer is required and the process is much more easily controlled.

The illustration shows how the chlorine content of the bath varies under the two methods of adding chlorine. Curve 1 drops off sharply, in spite of twice as much buffer as was used to produce Curve 2. In addition, after about 10 min. the bath temperature had to be raised to reactivate the bath. Curve 2 illustrates what happens when you add chlorine continuously. Less chlorine and less buffer are required, and a more workable process is the result.

Buffer Cuts Surface Effect

Trials were made on fabrics to find out how buffering affected the entire structure of the goods. When chlorination was done without buffering, the surface fibres of the goods were much more affected than the fibres in the interior. With a suitable buffer, chlorination is more even throughout the goods. The differences are clearly shown when goods treated with and without a buffer are dyed. Unbuffered goods tend to be unlevel. Microscopic examination also reveals almost total destruction of the fibre surface, which indicates that the chlorination has been overdone to the point of destroying in part the natural qualities of the fibre.

* *Geigy Chemical Corp.*

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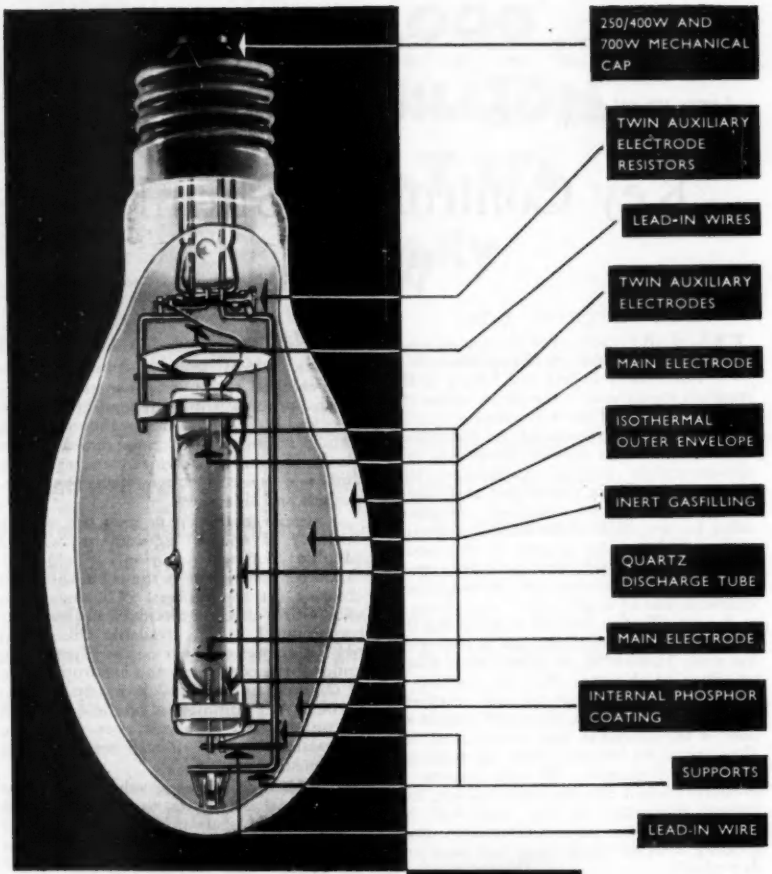

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Textile Trade and Prospects

Slight Easing-off in Lancs. Textiles

Trading conditions in yarns and cloths have not been quite as brisk as in recent weeks. Latest reports on the American crop position, fears about the Congo and the generally unsettled international situation have not established the most favourable atmosphere for promoting or expanding trade. There is a depressing lack of confidence throughout industry and it is to be hoped the forthcoming annual meeting of the International Federation of Cotton and Allied Textile Industries will dispel some of the prevailing uncertainties. The talks will include a survey of the present state of trade and the future prospects of the cotton and allied textile industries in the world. Quality aspects of raw cotton and current marketing problems will be discussed and a progress report will be given on U.S. cotton quality.

During the past month inquiry for yarns has covered practically every quality and count spun. Bookings have been fair but this easing-off has not affected the long delivery dates created by recent orderings in excess of current requirements arising from the spindle and loom scraping programme. Many buyers are now adopting a more cautious attitude. A slight hardening in American cotton prices has had repercussions in certain types. Standard weaving qualities have been reasonably well supported in medium counts on cone, cheese, cop and ring beams but quick delivery is almost impossible at the moment. Although shift working has helped considerably to keep productive capacity in reasonable relationship to demand the general tone of the market is a little unbalanced. Coarse numbers are still in good request and the support accorded fine counts remains firm. Certain doubling wefts are not now as keenly sought because of the reduced off-take in some doubled yarns. Hosiery qualities show little signs of slackening demand and condenser types sell on the same steady scale. Interest in core yarns is very good but the production available in no way satisfies the present and potential demand. Novelty and fancy folded specialities are not difficult to sell and blended yarns find ready buyers.

In cloths a considerable volume of inquiry has covered every type available. The business negotiated has been largely for the home market but a little more interest has been observed in one or two Continental outlets and slightly higher shipments have gone to a few Commonwealth markets. Substantial quantities of standard types of dress goods have been sold in woven and printed qualities, and more demand for shirtings has led to more orders being booked than for some months. Stocking for the Christmas buying spurt has been given additional impetus because of the present delivery position. Household textiles— in every kind—are now selling extremely well. Few lines are slow to go in view of future uncertainties about delivery and price. Table cloths, cotton blankets quilts, sheets, handkerchief and other cloths have all been extremely well bought. Fancy coloured dobby and jacquard terry towels in bright shades and contrasts find ready buyers, and tea cloths and boxed sets continue to find favour. A little more interest has also been observed in printed novelty roller towellings but no great increase in this direction is anticipated. Furnishing fabrics in dobby and jacquard styles of traditional and contemporary character are selling in satisfactory volume. Industrial cloths have attracted more attention but export business remains very poor indeed.

Wool Production and Trade

According to Wool Intelligence and Fibres Supplement, the Commonwealth Economic Committee's estimate this year of world wool production in 1960-61 will be about 5,560 million lbs., greasy basis, or 1% less than last season's revised total of 5,615 million lbs., and the first setback in world production since 1957-58. The fall is due almost entirely to expected reductions of around 5 and 7%. in the Australian and South African clips. On the other hand output in New Zealand will probably reach a new record and the South American position is showing a marked recovery after last year's floods. Although information from the Communist group of countries is still very limited, it is nevertheless known that bad weather in some important producing areas has reduced the sheep population this last winter; accordingly, only a marginal increase in their wool output has been allowed for this coming season.

Summary: Wool Production (million lbs., greasy)

	1959-60 Revised	1960-61 Estimate
Free world ..	4,522	4,454
Sino-Soviet bloc	1,093	1,106
Total ..	5,615	5,560

The whole of the reduction is in merino type wool, which is expected to fall by 3% from 1959-60. World exports of wool tops in the second quarter of the year at 62 million lbs. were 4% lower than in the previous quarter and 2% down on the same period of 1959. The U. K. continued to be the largest exporter and her exports fell only very slightly. The greatest decline was in exports from France and West Germany, while those from the primary producing countries, Uruguay and South Africa, increased, as did those from Japan. Over the whole six months Jan-June exports were 8% higher than in the first half of 1959.

Rate of wool consumption in the U.K. during July was 3% lower than in June and 7% below July last year, reports the Wool Industry Bureau of Statistics. Rate of top production was unchanged from the previous month but 9% below July last year, though worsted yarn deliveries were a little better than a year earlier. Chief improvement was shown in wool cloth deliveries, which were 4% higher than in June and also better than a year ago. The increase was chiefly in the worsted section. July output figures were Wool consumption, 36·62 million lbs; (clean); top production, 24·73 million lbs; tops drawn, 15·74 million lbs. worsted yarns delivered, 17·55 million lbs; woven fabrics delivered, 29·26 million sq. yds; blankets delivered, 2·17 million sq. yds.

Linen Trade Review

There is a growing tendency in recent years by individual firms in industry to seek help from external sources in the solution of internal problems, and professional consultants are now available to meet this need. These can be classified in two groups:—

(1) Those specialising in problems of internal organisation, management, costing, etc., which are more or less common to individual concerns in all industries and present a common mode of solution, or one that calls for only a minor deviation from the norm.

(2) Skilled technicians versed in the theory and technicalities of manufacture, with extensive experience of general practice, and capable of dealing with problems relative to material and machine performance.

British linen manufacturers have, in general, been more ready to admit their need for advice on matters of internal organisation than in the field of technical production. This is largely due to the conservative outlook that objects to revealing information to external agents on current practice in the fear that their loss might exceed their gain. This is in contrast to the attitude of overseas manufacturers, who are generally only too anxious to know how their methods compare with those of their competitors. Technical knowledge and experience is a valuable asset in a craft industry, such as linen, constituting the essential source from which new patterns and end products may be evolved.

Growing competition from rival textiles demands new methods of presentation, even of standard household ranges in order to retain this traditional market. While the products of some British firms are second to none in their consumer appeal, those of others display marked indifference to the exacting demands of the market. These call for versatility, combined with mobility, to avoid writing down unwanted stocks.

The breakdown of data for linen exports from the U.K. during the six months ending June 30 shows that demand was sustained over the whole production range. While expansion in export of yarns has been halted these were maintained at the 1959 level over the period. Those for thread rose by approximately 5% in value in this keenly contested market. House-

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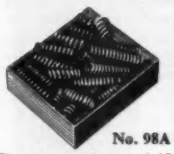

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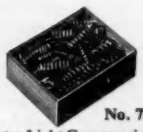

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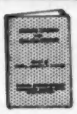

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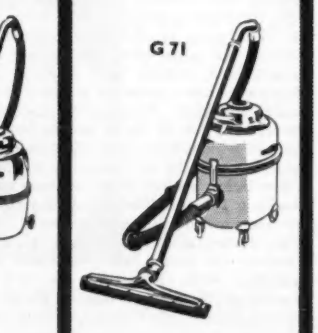

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hold linens (not embroidered) advanced by over 20% and handkerchief exports by over 15%.

While the amount of new business booked during the past month is substantially below that of the pre-holiday period this conforms to the general pattern. Overseas travellers are now working their usual autumn markets and the volume of inquiries and rate of bookings give no cause for concern. These cover the whole range of normal output. Increasing competition is being met in American markets from European manufacturers on each side of the Iron Curtain, as well as from the small but very active linen industry in Japan. The significance of the term "Irish linen" is without effect to the buyer of today, who relates quality with price to the advantage of our competitors.

Forward planning is seriously hampered by uncertainty regarding the raw material position. Inclement weather prior to, and during harvesting, has been responsible for considerable damage to the crop in the principal growing areas of West Europe. It has also hampered post-harvesting operations so that stocks of retted straw are lower than usual at this season. Field operations are still absorbing the main labour force output from scutch mills being small in bulk and variable in quality. Spinners are showing little interest beyond occasional purchases for immediate cover. Producers and users are concerned as to the timing, volume and price basis of exports from Soviet Russia, which will largely determine market values in the markets of West Europe, and also manufacturers' profits.

It is hinted that total exports will be less than last year in view of expanding requirements of the domestic manufacturing industry, which is stepping up the quality of its end products, and consequently is using an increasing amount of the higher grades of raw material, so that in this category less will be available for export. Plans already outlined envisage an early break into world markets with linen manufactures. In the event their dominance in raw material markets, together with lower manufacturing costs, would present a formidable problem to producers elsewhere.

The Scottish dry spun section is meeting considerable competition in the market for its linen end products. Normally large scale users of Russian flax, uncertainty of supply, combined with uneconomic prices, have made it increasingly difficult to compete with cotton and man-made fibre products. Some firms have been experimenting successfully with blends of these to manufacture industrial covers. The latter combine the advantages of greater durability and ease of handling to compensate for the higher initial cost.

Jute Fibre, Yarns and Fabrics

The raw jute market has been steady in Pakistan. Although one or two shippers have raised rates it is still possible to find sellers willing to accept the previous prices. The present steady market is due to various factors. The crop is about a month late, due to sowings delayed by lack of rain which means bulk supplies will be later than usual coming on the market. At the end of last season, Pakistan mills held small stocks of raw material but they have now been purchasing steadily and preventing stocks accumulating in sellers' hands. Imports of loose jute from up-country in East Pakistan are still small but a certain amount of buying which will have to take place may maintain prices at present levels. Indian mills have been granted licences to import fair quantities of cuttings from Pakistan and this also helps maintain a firm market. Sales of raw jute by Pakistan this season are well below those of last year but a substantial potential demand exists. The crops of India and Pakistan should be sufficient to meet world demand but on increase in buying could cause a shortage towards the end of the season.

The first estimate of area under cultivation in East Pakistan for 1960-61 is 1,518,000 acres against 1,375,000 acres in the corresponding estimate last year. This shows an increase of 10·4% and it is attributed to the abolition of the jute licencing system under which jute cultivation was restricted and the withdrawal of the ban on jute cultivation in the border areas. However, it is possible that the increase in the out-turn in fibre from the present crop will be less than the increase in acreage sown, as reports indicate that the yield per acre will be less than last season. The Indian crop is estimated at 6,200,000 bales consisting of 4,700,000 bales jute and 1,500,000 bales mesta.

Offers of raw jute are freely made but Dundee spinners show little interest; they appear to be limiting purchases to cover current yarn sales. The Continent on the other hand has shown increased interest and a fair amount of business has been transacted with most countries, mainly for early shipment at fairly high prices. Mill Firsts are generally quoted at £124, Mill Lightnings at £118, Mill Hearts at £114 and grade Hearts at £108, c.i.f. U.K., for Sept./Oct. shipment but in most instances up to 10s. per ton less would be accepted by some shippers. Dark jute has also remained steady with grade Tossa-2/3 offered at £123, grade Tossa-4 at £117 and Continental Tossa-2/3 at £113, Sept./Oct. Crack Daisee-2/3 was at £118 and grade Daisee-2/3 at £112 Oct./Nov. It is understood that the Pakistan authorities are to introduce f.o.b. minimum prices for raw jute at an early date. It is expected that the E.P.C. values will also be issued on a f.o.b. basis. In the past it has been the custom for both minimum prices and E.P.C. values to be quoted c.i.f. and this system has been found to be satisfactory to both buyers and sellers. From information received it is expected that the f.o.b. prices will be £11 per ton below the c.i.f. rates in the case of long jute and cuttings will show a difference of £8 per ton. This will make no difference to the ultimate price of jute and cuttings to consumers as business will continue to be transacted on a c.i.f. basis.

The Calcutta goods market has been steady during the past month. Prices of hessians have become dearer and are still at a high level. Some business has taken place to the U.K. but the quantities have not been large. Quotations are at 74s. 9d. for 10 oz. 40 in., and at 56s. for 7¼ oz. per 100 yds. f.o.b. Calcutta for September shipment, at 74s. and 55s. 9d. October, at 72s. 3d. and 55s. Nov./Dec. and at 70s. 6d. and 53s. 9d. Jan./Mar. B twills are at 215s. 3d., 206s. 3d., 195s. 6d. and 193s. 6d. for the respective shipment periods. Demand for yarns and cloth in Dundee has been limited of late and buyers have restricted their purchases to cover their immediate requirements. Prices have remained unchanged since August 9 and a fair amount of business was placed prior to rates being increased.

Silk and Man-Made Fibres

Activity in the past month has tended to slacken but there has been a fair amount of forward booking for next spring with indications of record figures by some concerns. The placing of orders by manufacturers for yarn is one indication but converters and makers-up are also pressing for deliveries so that there is no hold-up of goods to wholesale and retail outlets. A good deal of interest has been expressed in novelty weaves and fancy type fabrics especially in blends. For dress fabrics the future seems very promising for acetate, both secondary and "Tricel", and of course nylon. Viscose is also expected to have a good proportion of sales in dress fabrics, judging by inquiries and advance orders now being placed. In shirtings, there is of course a steady interest in acrylics but "Terylene"/cotton blends seem to be firmly established favourites, limited only by the availability of supplies.

In furnishings, there is a return to more traditional styles in both design and construction. Printed styles—particularly duplex—are now very popular. Tufted manufacturers have well-filled order books, many at a record high level, with viscose and nylon/wool blends in extremely good demand.

In Yorkshire, acrylics and "Terylene" are being steadily employed in increasing quantities and there is also considerable interest in the steady development of knitting in the West Riding together with increasing activities in tufted manufacture. The knitting industry, young though it is, in these parts, is vigorous and well capable of expansion. Demand is for most of the newer fibres and the output is chiefly knitted outerwear. In the Leek area business has been good but a little scrappy at times. The smallwares side has been rather dull but some narrow fabric manufacturers are reasonably well employed. Interest in braids and trimmings has been maintaiedn and makers-up are especially active; the labour recruitment is a problem here. Sewing threads are in steady demand with the newer threads, especially blends of "Terylene" and cotton, being popular. Silk, too, is keeping its steady position as is viscose for domestic sewings.

The Midlands area again reports intense competition from overseas' sources and the influx of cheap nylons is causing grave concern to many stocking manufacturers who are working already to fine margins. Consequently there is a growing interest in most types of outerwear, and here the newer fibres show their versatility in novelty knits and effects. For many sections of underwear, blends of nylon and cotton yarns are wanted, and in some districts various yarns are said to be in short supply.

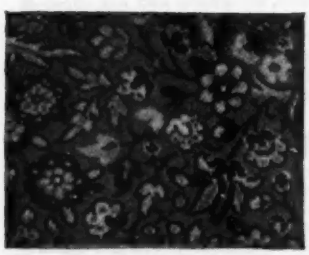
1835 1845 1855 1865 1875 1885 1895 1905 1915 1925 1935 1945 1955

WEAVING *through the years...*

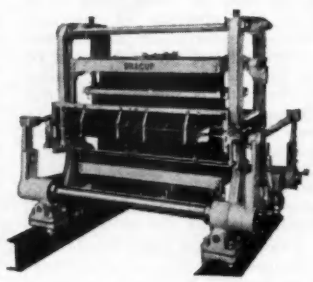
1960

In the year 1825 Samuel Dracup founded a Jacquard Machine business destined to become world-wide in importance. The textile industry of the world now acknowledges that Jacquard machines by DRACUP are the finest obtainable. They step up production, reduce operational overheads and have a range of pitches and capacities to meet all purposes.

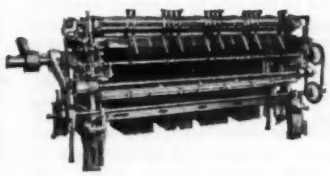
We invite you to weave better, faster and cheaper with Dracup Jacquards.



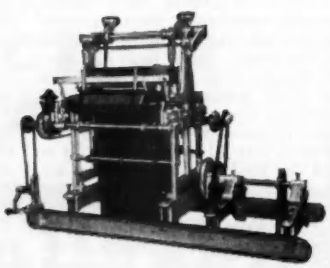
Continuous research is rapidly bringing forward developments that must help in the shaping of your future programme. Our advice is yours for the asking.



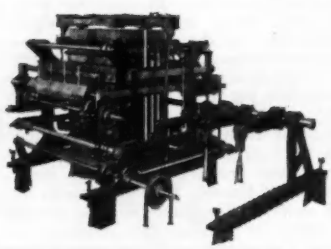
Heavy duty matting Jacquard for SISAL and COIR matting. Available in all sizes up to 24/4.



8/4 Single Wilton Jacquard for high speed production. Machines also available for Double Wilton carpets. Both types supplied any size in any pitch.



New type coarse pitch double lift single cylinder Jacquard. Available in all standard sizes. Double cylinder machines of similar design also available.



3-position Moquette Jacquard for all normal moquette weaves and special float effects.

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THE BRITISH JACQUARD PIONEERS Established 1825

LANE CLOSE MILLS · GREAT HORTON · BRADFORD 7 · YORKSHIRE
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EVERY DRACUP JACQUARD IS BACKED BY OVER 130 YEARS EXPERIENCE

Notes and News

Australian Wool Clip Forecast

Australia's National Council of Wool Selling Brokers announces that the weight of wool expected to pass through brokers' stores in the coming 1960-61 season is 4,729,000 bales, approximately 5% less than the revised estimate of 4,973,400 bales for the 1959-60 season just ended during which Australia marketed a record wool clip. Estimated at 1,600 million lbs. (greasy), the new clip compares with a revised estimate of 1,690 million lbs. for 1959-60 season, of which 1,454 million lbs. is expected to be shorn wool, 42 million lbs. dead and fellmongered, and 104 million lbs. exported on the skin. Merino wool in the new clip is estimated at 76%, and the weight per bale at 302 lbs.

• • •

Mechanical Handling

The next Mechanical Handling Exhibition is to be held at Earls Court, London, England, from May 8th to 18th, 1962. It will be the eighth in the series of this biennial exhibition which started in a modest way in 1948. Over 300 firms displayed their products at the 1960 exhibition, occupying 500,000 sq. ft. of space within the hall and extending into the forecourt to provide a spacious outdoor demonstration area. Record numbers of visitors came to the 1960 show and overseas visitors, 45% greater in number than on any previous occasion, came from 77 different countries. Details of stand space and facilities can be obtained from H. A. Collman, Dorset House, Stamford Street, London, S.E.1, England.

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U.K. Stockpile Wool

Further stage in the gradual disposal of the U.K. Government's strategic stockpile of Commonwealth wool is announced by the British Wool Federation. At the five series of London wool sales to be held from September to the end of February 1961, 51,250 bales of stockpile wool will be offered at auction, the total comprising 32,900 bales of Australian wool, 12,300 bales of New Zealand, and 6,050 bales of South African.

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London Wool Brokers' Appointments

London Wool Brokers Ltd., announce the appointment of Mr. C. A. Ellis as secretary of the company. He succeeds Mr. R. C. Umney, who remains a director of the company and also secretary of London Wool Brokers (Holding) Ltd.

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New Fluorescent Lamp

A new Mazda fluorescent lamp is announced which is claimed to give the nearest light to daylight yet achieved by lamp makers. There are applications for the new lamp in every industry where a natural rendering of colours is necessary. In particular, the new lamp is expected to be used for the design, development and manufacture of colourful products and also for display and selling in shops and stores, thus ensuring consumer satisfaction with products under artificial light and used in daylight.

A.E.I. lamp designers describe the light given by the lamp to be in the noon sunlight region. The colour conscious shopper has always found it necessary to inspect goods in daylight. This inconvenience to the customer can now be eliminated immediately where fluorescent lighting is used, as the new lamp is already obtainable. Available as a 5 ft. 80-watt lamp with B.C. or Bi-pin cap and 4 ft. 40-watt lamp with Bi-pin cap only, the *Kolor-rite lamp has an estimated life of 5,000 hours with an average output of 2,560 and 1,360 lumens respectively.

• • •

Proban to Introduce Selvage Stamping

Proban Ltd., are to introduce a scheme whereby Proban treated flame-resistant fabrics will be identified by selvage stamping. This will be additional to the labelling and quality control scheme they have been operating for the last two years. The selvage on Proban treated cloth will in future carry the statement "Proban durable flame-resistant finish. B.S.3120. Use no Bleach". Mr. F. H. Howes (General Sales manager, Proban Ltd.), said that he recently concluded arrangements with licensees now ready to operate the new Proban finish to introduce selvage stamping as soon as practicable. Finishers already granted licences to treat cloth with the new Proban finish are Crossland and Pickstone Ltd., Bury, Lancs.; Samuel Heap and Sons Ltd.; Rochdale, Lancs.; J. Hardcastle and Co. Ltd., Bradshaw, nr. Bolton, Lancs.; Low Moor and Water Lane Ltd., Bradford; Lumsden and MacKenzie, Ltd., Almond Bank, nr. Perth, Scotland; Parkside Dyeing Co. Ltd., Bradford; John Stanning and Son Ltd., Leyland, Lancs; and Westside Dyeing Co. Ltd., Bradford.

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Change of Address

Mr. Robert S. Maynard—agent for S.A. Metiers Automatiques Picanol, Ypres, Belgium, and Gilbos, Ateliers de Construction, Alost—has moved from Langham Court, Fielden Park, Manchester, to New Rex Buildings, Wilmslow, Ches. (Tel. Wilmslow 5849).

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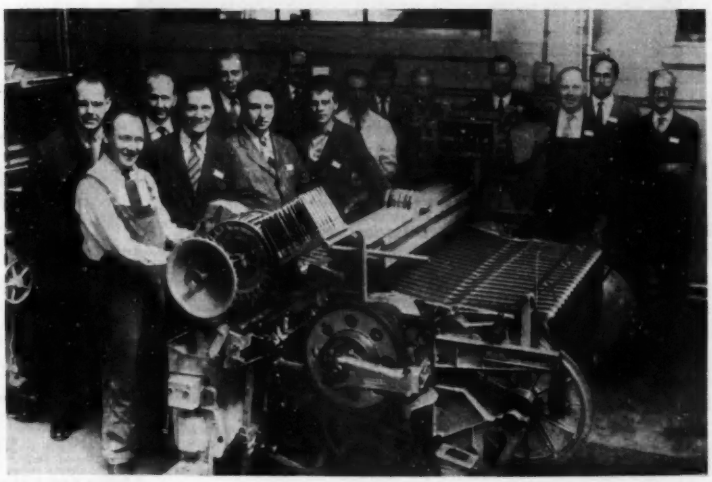
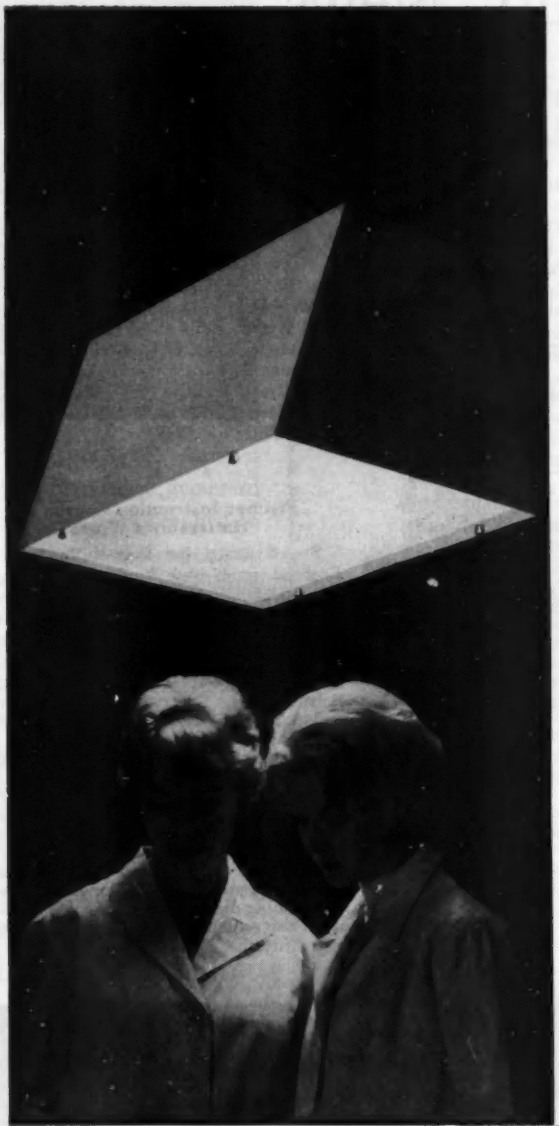
Fischer Instruction Course at Hattersley's Works

Stated to be the first to be held in England, on George Fischer's four-colour circular battery Model T.M.B., an instruction course was held recently at the Keighley works of George Hattersley and Sons Ltd. Messrs. Fischer's chief instructor, Mr. G. Ruckstuhl, was flown from Schaffhausen, Switzerland, for the occasion, and was assisted by Mr. E. Kurth, their chief engineer in England.

Attended by thirteen technicians from nine well-known firms using the T.M.B. battery, instruction was given on the mechanism, stripping and re-assembly, mounting on the loom, settings, setting gauges, and weft control in the shuttle. A training film was shown on the second day; and the party were entertained in Leeds one evening during the course. We understand this function is likely to be repeated in the future.



The group on the course photographed round Hattersley's 382 Model, 4 × 1 box, silk and rayon loom equipped with Fischer's T.M.B.S4 Model battery

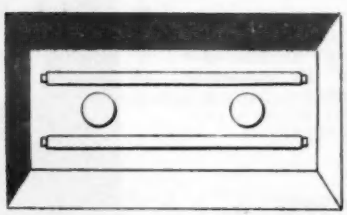


a colour matching unit that doesn't cost the earth

The Siemens Ediswan Industrial Colour Matching Unit is efficient without being expensive and there's nothing to adjust, no knobs to twiddle, no calculations to do. Simply switch on and get all the north sky daylight you need for matching paints, materials, inks, dyes, cosmetics—and get it exactly the same, time after time for the whole long life of the lamps.
At £25 complete with lamps you can afford to have one in every department or on every floor.

INDUSTRIAL COLOUR MATCHING UNIT TYPE F 2444

Following the reorganisation of the A.E.I. Group these products continue to be sold from former Siemens Edison Swan offices throughout the country. Our staff are unchanged and your enquiries and orders will be welcomed.



PRICE
£25
including P.T. on lamps.
Complete with control gear, lamps (2 filament and 2 blue fluorescent) remote control box and 2 yd. 7-core cable.

SIEMENS EDISWAN

Lamps and Lighting Division
38/39 Upper Thames Street, London EC4
Telephone: CENtral 2332
District Office and Branches throughout the country

CRC1159

Where to Find It

The Commercial Library, Central Library, Manchester 2, offers free of charge three publications designed particularly to help those engaged in overseas trade The first, "Shipping," shows the library's resources in the literature relating to marine insurance, cargo-handling, port facilities and shipping movements, in addition to shipping registers and directories. "National Atlases" lists atlases of individual countries and the information to be obtained from them, together with notes on larger-scale maps available for each country. The latest, No. 20, in the "European Economic Co-operation" series of reading lists covers recent books and periodical articles on E.F.T.A. and E.E.C. Copies are available on request from the Commercial Library (Central 7401. Telex 66149).

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I.C.I. to Manufacture Polypropylene Fibre

An agreement for the exclusive production in the U.K. of staple fibre, filament yarns and monofilaments from polypropylene has been signed between I.C.I. Ltd. and Montecatini of Milan, and plant to make 10,000 tons a year of this polymer will come into operation at Wilton, Yorkshire, later this year. Polypropylene fibres are the outcome of the researches of Prof. Giulio Natta, and the new fibres are currently being produced in Italy by Polymer S.A., a subsidiary of Montecatini, under the trade name "Meraklon." Polypropylene fibres are said to be of high strength, durability and light. Alone, or in combination with other fibres, they are expected to find uses in apparel, carpets, household textiles, rope and cordage.

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Marketing Machinery in Europe

A new company, Coates Smith (Zurich) Ltd., Bahnhof Quai 9, Zurich, has been formed to enable Coates Smith Ltd., Nottingham, to market more British-manufactured textile equipment in Europe and other parts of the world, through the chain of agents and contacts they have built up. Although primarily interested in the warp knitting, hosiery and dyeing and finishing trades, the company hope to market overseas also other British textile machinery and accessory equipment. In addition the Swiss company will enable Coates Smith Ltd. to keep in touch more readily with important European developments.

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U.S.A. Wool Clip

The U.S. Department of Agriculture estimates that U.S. production of shorn wool in 1960 will amount to 265 million lb. (greasy basis), some 3% more than last year and the biggest domestic clip for 14 years.

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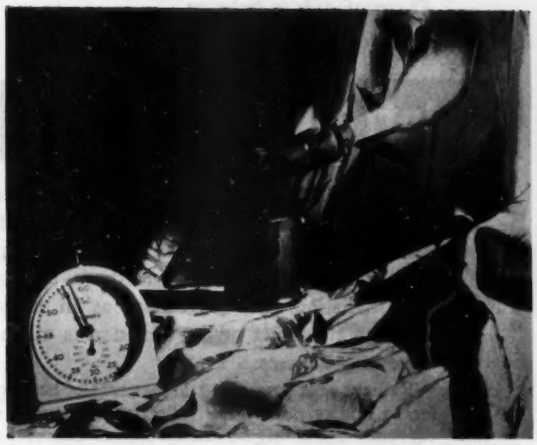
British Wool Output

A big increase in U.K. wool production over the past ten years is revealed in the annual report of the British Wool Marketing Board. The 1959 clip of nearly 83 million lb. was the heaviest for 25 years and 43% greater than that of 1950. The U.K. is the outstanding wool producing country of Europe, the number of registered growers having increased in ten years from 110,000 to more than 130,000. "British wool", says the Board, "has steadily improved its competitive position on the world market in the past 10 years and now consistently makes a higher average price than wool of similar type produced in any other country.



Could any fabric be subjected to a more drastic and concentrated treatment? After two minutes under the intense flame from a blow-lamp the only apparent damage to this sample of "Fothergay Sun-drapes" was slight discoloration where colour print had been burnt off. The cloth itself was practically unmarked

• • •

New Vinyl/Cotton Fabric

Imperial Comarra, a new fabric recently perfected by Cohn-Hall-Marx Co., New York, is now available in Britain,and will be marketed in the U.K. by United Merchants and Manufacturers (U.K.) Ltd., 26-28 Great Portland Street, London W.1. It has an outer surface of expanded vinyl and a backing of knitted cotton, and is suitable for a wide variety of textile application for which leather is traditionally used. It wipes clean with soap and water. With either a natural or pearl finish, Comarra is now available in sixteen shades, including white, black and a variety of greens, blues, greys and browns. New colours are constantly being added to the range. The fabric width is 54 in.

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New Finish for Cottons

A new finish for cotton fabrics (Magipel) —said to be water-repellant, stain resistant and soil and grease resistant for the life of the garment—will be introduced into the "Coolino" range of fabrics marketed by Arthur Tate and Co., 26-28 Great Portland Street, London, W.1, a division of United Merchants and Manufacturers (U.K.) Ltd. First with the new finish will be a cotton poplin, particularly suitable for rainwear, golf jackets and leisure slacks. Other fabrics will be given the new finish later.

New Companies

Grove Spinning Co. Ltd. Private. Reg. July 12. Capital £2,000 in £1 shares. Woollen, cotton and angora yarn spinners, etc. B. Earnshaw, E. Hoyle. Solicitors: Drabble and Co., Huddersfield.

Birchton Lace Co. Ltd. Private. Reg. July 15. Capital £2,000 in £1 shares. Manufacturers, agents and exporters of lace products, etc. Al Birchton and Mrs. J. F. Birchton. Registered office: 19 St. Mary's Gate, Nottingham.

Cambridge Hosiery Co. Ltd. Private. Reg. July 18. Capital £10,000 in £1 shares. Manufacturers of hosiery, etc. H. E. Heaton and Mrs. E. M. Heaton. Registered Office: 73 Wells Street, W.1.

Grosvenor Textiles Ltd. Private. Reg. July 18. Capital £1,000 in £1 shares. Manufacturers of textile fabrics, etc. J. J. Mortimer and I. Mortimer, both of 203 Ecclesall Road South, Sheffield 11. Registered office: Grosvenor House, Nursery Street, Sheffield 3.

Wilfred G. Phillips and Co. Ltd. Private. Reg. July 18. Capital £25,000 in shares of £1. Textile manufacturers, etc. R. P. Loney and V. P. Whittington. Registered office: 7 Carburton Street, W.1.

Moorston Fabrics Ltd. Private. Reg. July 18. Capital £1,000 in £1 shares. Ed. N. Johnston, V. S. Kenyon and A. Squires. Registered office: Manor Buildings, 2 Manor Row, Bradford 1.

F. Wilson Steele Ltd. Private. Reg. July 20. Capital £2,000 in £1 shares. Exporters and importers of cottons, woollens and other textile fabrics, etc. J. Pizzy and N. Foulger, C.A. Registered office: 01 Fore Street, E.C.2.

J. Ainslie and Sons Ltd. Private. Reg. July 26. Capital £25,000 in £1 shares. Manufacturers of all metal textile goods. The permanent directors are: J. Ainslie and D. Ainslie. Registered office: Portwood Works, Croft Street, Stockport.

F. Bradley Ltd. Private. Reg. July 26. Capital £3,000 in £1 shares. Manufacturers and dealers in textiles, etc. F. Bradley and F. Baldwin. Registered Office: Throstle Nest Mill, Bankhouse Road, Nelson, Lancs.

Samuel S. Mee Ltd. Private. Reg. July 29. Capital £4,000 in £1 shares. Manufacturers and exporters of worsted, woollen, cotton, silk, rayon and cashmere yarns and wastes, etc. G. Benson and S. R. Mee. Registered office: 1 West Street, Leicester.

H.A.F. (Huddersfield) Ltd. Private. Reg. July 27. Capital £30,000 in £1 shares. Cotton spinners, doublers, etc. F. Taylor, V. Sanderson. Registered office: 2 Cloth Hall Street, Huddersfield.

Nu-Fibres Ltd. Private. Reg. July 27. Capital £1,000 in £1 shares. Processors, manufacturers and dealers in fibres, etc. C. J. A. Dixon and D. O. Hamilton. Solicitors: Norton Rose and Co., Kempson House, Camomile Street, E.C.3.

Edwin Dawson and Son (Huddersfield) Ltd. Private. Reg. Aug. 3. Capital £10,000 in £1 shares. Manufacturers and merchants of shoddy, mungo, cotton, etc. A. Dawson and E. Dawson. Solicitors: Eaton Smith and Downey, Huddersfield.

Donaire Ltd. Private. Reg. Aug. 4. Capital £50,000 in £1 shares. Spinners, weavers, knitters, importers and exporters of textile fabrics, etc. G. Ll. Law and G. B. Inglis. Solicitors: Slaughter and May, 18 Austin Friars, E.C.2.

Mo and Domsjo Cellulose Ltd. Private. Reg. Aug. 9. Capital £1,000 in £1 shares. F. Keene and R. A. Johnson. Directors: J. C. Kempe, B. Lyberg, S. Kempe, A. Altback and K. Cockrane. Solicitors: Warmingtons and Trevor Jones, Albany Courtyard, W.1.

Nylotuft Ltd. Private. Reg. Aug. 4. Capital £10,000 in £1 shares. Manufacturers of nylon, "Terylene," cotton, wool, etc. H. Joseph and C. Sidle. Reg. office: Hatherleigh Place, Abergavenny, Mon.

Key Fabrics Ltd. Private. Reg. Aug. 9. Capital £1,000 in £1 shares. A. E. Nathan and D. R. Nathan, S. Nathan and Mrs. L. Nathan. Registered office: 5 Station Parade, Green Street, E.13.

Globus Textiles Ltd. Private. Reg. Aug. 10. Capital £1,000 in £1 shares. E. Rayner and E. M. Gostick. Registered office: Globus Buildings, 1 Smith Street, Bradford.

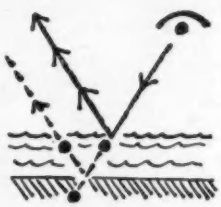
Calder Valley Mill Co. Ltd. Private. Reg. Aug. 3. Capital £30,000 in £1 shares. Manufacturers and dealers in cotton, etc. J. Lowe and J.W.W. Atkinson. Registered office: Elm Street Mill, Burnley.

CUT HERE

Infra-Red Heating

Infra-red heating is the name given to the method of using in industrial processes radiant heat from heaters specifically designed for that purpose. This differentiates it from methods employing both radiation and convection, as in furnaces, although the effect of the radiation is much the same in both cases.

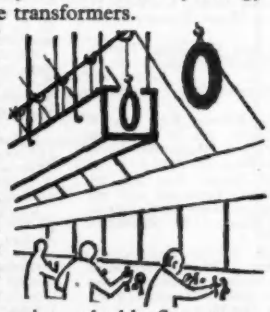
Radiant heat provides a higher rate of heat transfer to bodies not highly reflective than does convection, unless high-velocity forced convection is used. The rate of heating of a body depends upon the intensity of radiation on its surface, the proportion absorbed by the surface and, subsequently, on heat conduction. In heating very thin bodies, for example paint films, the radiation not reflected nor absorbed passes through and is in turn reflected or absorbed by the underlying material. This reflected heat is partly absorbed by the paint film "on the way back". Despite this effect it is an exaggeration to claim that infra-red "heats from the inside out" and it remains largely a surface heating effect except in a few special cases.



Infra-red heaters mainly use metal-sheathed elements in special reflectors, but infra-red lamps with internal reflectors are still used in special cases. Other types use silica-sheathed elements or quartz-sheathed lamps in reflectors. A wide range of heaters is available with simple mounting arrangements to enable heat to be applied quickly and effectively either in a production line or in some odd corner.

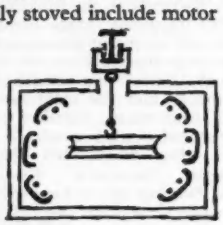
Control of the charge temperature is effected by regulating the heating time and power. In the case of a moving charge, this is done by adjusting the conveyor speed and the number of heaters in circuit, i.e., by adjusting the effective length of the oven. Some of the heaters may be controlled by energy regulators or adjustable transformers.

The advantages of infra-red heating over convection heating include reduced heating times, reduced floor space, lower installation costs, almost instant starting, ability to focus the heat, and flexibility in effective oven length. Infra-red ovens can often be mounted in the roof, saving valuable floor space. Infra-red heating is not generally favourable for heating large bodies of low heat conductivity.



Paint Stoving

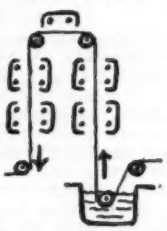
Not all paints are suited to infra-red radiation, but suitable paints are stoved quickly and often give a better finish. Synthetic enamels are the most suitable. Articles successfully stoved include motor car bodies, wheels and other accessories, refrigerator and washing machine cabinets, cylindrical drums and barrels, metal furniture, valve hand wheels, metal toys and a host of other articles. Lacquers and varnishes are being quickly and effectively stoved on jewellery, packing strips, tubes, films and similar products. Special infra-red lamp ovens stove synthetic finishes on wooden furniture and components. In all cases stoving times have been reduced very considerably.



Moisture Extraction

Sheathed element heaters are particularly useful for drying surface water films, their radiation being readily absorbed by water. High rates of drying are possible provided the water vapour can readily disperse. Drying of "contained" water can be effected provided the water can diffuse from the interior at a rate equalling the surface drying rate. With heat-sensitive materials sheathed element heaters may have to be arranged to move away from the material to avoid overheating if the conveyor stops, being interlocked with the conveyor for this purpose. Lamps are sometimes used instead for such materials because of their instantaneous cut-off.

Infra-red is widely used for drying coatings and inks on paper and textile products, bottle seals and labels, clayware and glazes, pigments on leather and many other products.



Plastic Heating

Infra-red heating is widely used in the plastics and allied industries. Typical applications are the preheating of plastic pellets and of sheets prior to moulding, curing of plastic and rubber sheets and belts, heat setting of nylon and similar fabrics, drying and curing of latex films on carpets and many others where a plastic forms the whole or part of the product.

The above are just a few examples of successful applications of infra-red. In many other processes infra-red heaters can often be fitted quickly and cheaply, to save time, labour and floor space and, therefore, money.

For further information, get in touch with your Electricity Board or write direct to the Electrical Development Association, 2 Savoy Hill, London W.C.2. Telephone: TEMple Bar 9434.

Excellent reference books on electricity and productivity (8/6 each, or 9/- post free) are available — "Resistance Heating" is an example; "Induction and Dielectric Heating" is another.

E.D.A. also have available on free loan in the United Kingdom a series of films on the industrial uses of electricity. Ask for a catalogue.

RECENT TEXTILE PATENTS

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820,253 Pressure Device for Drafting Rollers

SKF KUGELLAGERFABRIKEN GESELLSCHAFT MIT BESCHRANKTER HAFTUNG, 13 *Ernst Sachs Strasse, Schweinfurt am Main, Germany.*

A drafting mechanism which, as a result of a simple and rapid conversion, can be used both for the processing of cotton, and of synthetic fibres requiring considerably higher roll pressures. The weighting means take up little room and ensure a satisfactory and rapid settling movement of the top rolls into parallelism with the bottom rolls. These objects are achieved by providing a flat spiral spring as weighting means for the top rolls. Preferably, one spring is allocated to each guide arm, the spring and the guide arm being received in a common holder which can be adjusted in position in the top-roll carrying and weighting arm.

820,383 Adjustable Teazles on Raising Machines

TOMLINSONS (ROCHDALE) LTD., *Soho Works, Rochdale.*

Raising machines suffer many disadvantages, the main ones being the lack of control over the cloth and over the amount of raise due to the constant angle of inclination of the teazles which limit the effects obtainable. The object of the invention to provide a raising machine which reduces the disadvantages, in that, the angle of inclination of the teazles of each row is adjustable.

820,481 Yarn Tension Control

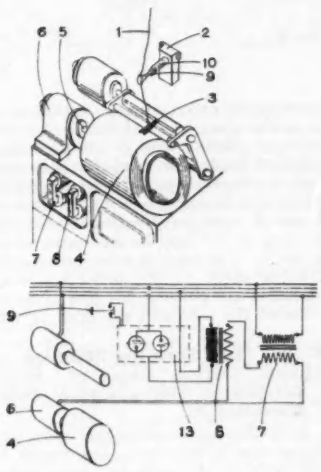
HAROLD STANIER, *Upton House, Upton Bishop, Ross-on-Wye, Herefordshire.*

A yarn control device being an improvement of BP. No. 795,800, wherein movement of a counterweighted lever in use, not only controls the tension applied to the yarn by a disc-like portion and disc, but also, as the lever is caused on relief of yarn tension to move, the position in which a further eyelet determines the longest path for the yarn through the device, acts to make or break an electric contact arranged for connection in an electric circuit controlling the machine or device utilising the yarn.

820,640 Constant Winding Arrangement

BARMER MASCHINENFABRIK AKT. GES., *Wuppertal-Oberbarmen, Germany.*

A winding arrangement for spinning, twisting and winding machines. Yarn 1 travels via a sensing member 2 and a yarn guide 3 to a wound package 4. A winding spindle 5 is driven by an electric motor 6, for example an alternating-current motor having a short-circuited rotor having increased rotor resistance or a corresponding slip-sleeve motor (Ferraris type) which is connected in a circuit, the basic electric voltage of which it is proposed to adjust so that the value lies within the maximum and minimum operating voltages required. The



basic voltage is adjusted by means of an adjustable main transformer 7 and a control transformer 8. The regulating arrangement, consisting of the sensing member 2 and two-point switching unit 13, which regulates the supply of the varying electric voltage required for producing the necessary winding speed, acts on a control transformer 8 arranged in the motor circuit. The secondaries of the main transformer 7 and control transformer 8 are connected in series, and the control transformer is continuously connected to and disconnected from the supply voltage by the switching unit 13. When connected to the supply, it feeds voltage into the motor circuit and when disconnected the secondary of the control transformer acts as a choke which constitutes an impedance which reduces the motor voltage. The sensing member which is adjusted by the yarn tension consists of a sensing pin 9 loaded by a small spring 10. The sensing pin actuates a suitable switching arrangement for the control transformer, the simplest form of such switching arrangement being a contact, in series with which a relay may be connected to protect it to the greatest possible extent.

820,723 Improved Ring and Traveller

JAMES MACKIE AND SONS LTD., *Albert Foundry, Belfast, Northern Ireland.*

Relates to the wet spinning of yarns using travellers, described in B.P. No. 722,807. The ring is formed with a broad flat inner flange 1, against the inside of which the inner end of the traveller may bear. The traveller 2 is formed of a synthetic wear-resisting plastic, and has an enlarged foot 3, which bears against the underside of the flange. The outer tip 4 of the traveller runs in a groove 5 on the outer surface of the ring. The position of this groove and its width in relation to the tip of the traveller is such that when the traveller is running, the tip can bear against either the upper or lower side of the groove. The lower side of the groove is extended to form a flange 6 against which the tip bears squarely so as to avoid any tendency to a wedging action. Groove 5 serves an additional function, in that when the traveller is stationary, the tip 4 is located

between the two sides of the groove and the traveller is held in a more or less upright position. It is thus immediately ready for starting and does not need to rely on the tension of the yarn for pulling it into its working position. Under running conditions the inward pull of the yarn is balanced by the outward effect of centrifugal force and the tendency is for the tip to bear against the lower side of the groove. Above the flange, the surface of the ring slopes upward and outward at 7 and then terminates in a narrow horizontal portion 8. As may be seen from the position of the traveller shown as 2^1 in dotted lines, the enlarged foot is inclined to the general line of the arm of the traveller. This assists the traveller to take up its normal inclination under running conditions.

821,023 Varying Drafting Force in Drafting Rollers

LINEN INDUSTRY RESEARCH ASSOCIATION, *Lambeg, Co. Antrim, Northern Ireland.*

Improved apparatus for the drafting of fibres and particularly for varying the draft in accordance with the drafting force.

The sliver 1 passes through the pair of positively driven feed rollers, 2, 2, over or through the various control and gauging members 4, 5, 7 and 8 to the pair of positively driven drafting rollers, 3, 3, from which it emerges as drafted sliver 9. The sliver emerging from the feed rollers, passes over or through a guide 4, over the guide 5, which is attached to and moved by the transducer 6 in a direction which is perpendicular to the direction of travel of the sliver and in accordance with signals from the gauging unit 7 either immediately or after a suitable delay, and thence to a second guide 8, over or through the gauging unit 7, to the rollers 3, 3. An alternative position for the unit 7, between the feed rollers and the guide 4 is shown in dotted lines. Alternatively, the gauging unit may be incorporated in any of the guide or control members 4, 5 and 8. The guides 4 and 8 may be rods or guides or they may consist of single or a number of positively driven rollers or of pairs of plain or flanged rollers of which one is positively driven whilst the other rests on it or they may consist of single or pairs of positively driven belts or aprons. In the case of slivers of fibres such as flax or

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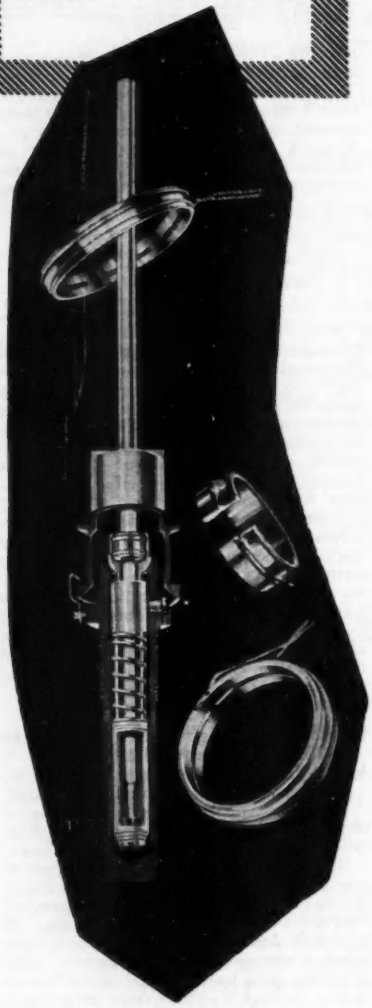

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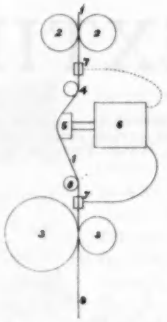
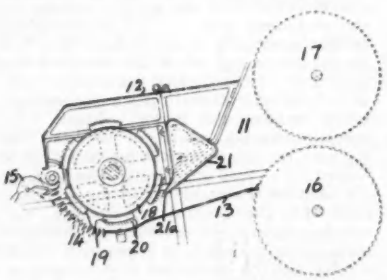


uncrimped rayon staple, stationary rods or guides may be used but in the case of crimped fibres such as wool, cotton or crimped staple man-made fibres, positively driven rollers or pairs of belts are preferred. Alternatively, either or both of the members 4 and 8 may be dispensed with or the gauging unit 7 may be incorporated in the guide 5. The gauging unit 7 measures the drafting force on the sliver and may be placed at any point on the line of the sliver between the feed and the drafting rollers.

821,041 Lap Forming Machine

BRITISH COTTON INDUSTRY RESEARCH ASSOCIATION, *Shirley Institute, Didsbury, Manchester* 20.

Describes lap-forming machines for use in the textile industry. The beater compartment is bounded by side walls 11, upper cover 12, lower cover 13, grid bars 14, pedal feed 15, and rotary suction cages 16, 17. At the forward end of the compartment a beater 18 has a closed periphery on which are mounted six equispaced arcuate bases 19, each carrying the usual spikes 20. The cover 12 extends upward and then passes horizontally over the beater at a distance from it, roughly equal to half the radial measurement of the beater. The basic beater radius is 7½ ins., the radius to the points of the spikes being 9 ins. The spacing of the cover 12 from the highest



point reached by the spikes is preferably 3½ ins., but can be between about 3 ins. and 4½ ins. A baffle 21, extending the full width of the compartment, and supported by the side walls 11 and any additional structural members, is located adjacent that part of the periphery of the beater opposite to the feed arrangement. The baffle is triangular in section, its lower plane lying in the tangent plane from the centre of the upper cage 17 to the bottom of the periphery of the beater. The face of the baffle nearest to the beater is closest to the beater at its lowest point 21*a*, where it is from a quarter to a ¼ in. from the beater periphery, and diverges from there to the top of the baffle which is level with the upper portion of the periphery of the beater. The fibrous material is struck down by the beater on to the grid bars and carried forward by the suction of the cages. The disposition of the cover 12 and baffle ensures that all the fibres are removed from the beater each revolution, intimately mixed and condensed on to the cages so as to form a coherent and even lap.

821,135 Anti-Felting Treatment for Wool

FINISHING PROCESSES (TEXTILES) LTD., 30 *Meadow Lane, Loughborough.*

In a process for the treatment of wool goods to reduce their tendency to felt or shrink, the material is treated with a dispersion of a plasticised or unplasticised synthetic resin which contains a cationic dispersing agent at a *p*H of less than 7, preferably 4 to 6, and is then subjected to the action of an anti-felting halogenating agent, also at a *p*H of less than 7, preferably 4 to 6. In one example, 300 Imperial gallons of water at a temperature of 70 to 75°F were placed in a paddle dyeing machine and sufficient formic acid was added to bring the *p*H to 5. There was added 1 lb. of a dispersion of polymethyl methacrylate plasticised with dibutyl phthalate, and containing 32 to 34% of total solids, the plasticiser content being 40% of the total solids, and containing cetyl pyridinium bromide as a cationic dispersing agent in conjunction with a non-ionic dispersing agent, 100 lbs. of wool half-hose which had previously been scoured with a non-ionic scouring agent and brought to a *p*H of 5 with formic acid were then added to the bath, and allowed to circulate for 15 mins., by which time the plasticised polymethyl methacrylate had been completely exhausted from the bath on to the wool. The goods were then lifted and treated in a fresh bath with a liquid to which had been added 8½ Imperial pints of commercial sodium hypochlorite (containing 15% of available chlorine) solution so as to give a concentration of approximately 2% of available chlorine, calculated on the weight of the wool, and sufficient formic acid to give a *p*H of 5. The wool was treated for 15 mins. and then treated in the same bath with 10 lbs. of commercial sodium sulphite to clear any remaining chlorine, and rinsed.

821,168 Improved Bleaching Method

BLEACHERS' ASSOCIATION LTD., *Manchester*, and F. R. W. SLOAN.

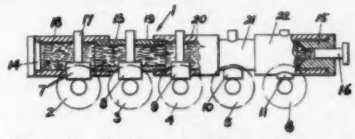
A process for the bleaching of fibres, yarns or fabrics comprises subjecting them to the action of a solution containing sodium chlorite and an alkylene glycol polyester having free carboxyl groups. The polyester is preferably one having a high acid value. In one example, about 10 pieces of singed grey cotton pique weighing 8 oz./sq. yd. are batched on a ceramic enclosed jig. To 60 gallons of water in the jig is added 12 lbs. of sodium chlorite, 9 lbs. of triethylene glycol succinic acid polyester (ratio 0·5 to 1) having an acid value of about 250. The temperature is raised to 30°C and the load lowered and bleaching commenced. After approximately 1 hour continuous operation, the hood is raised and the batch run off into another jig set with 60 gallons of water and containing 6 lbs. of caustic soda flakes and 6 lbs. soap. The bath is raised to the boil and after 1 hour continuous treatment, the batch is washed off and finally rinsed with N/20 hydrochloric acid. The batch is then

run back into the bleaching jig and treated for 1 hour. It is then returned to the second jig and washed off with boiling water, or alternatively washed on a washing range. A good white of excellent stability is obtained.

821,443. Hydraulic Pressure for Top Rollers

VEB SPINNEREIMASCHINENBAU KARL-MARX-STADT, *Altchemnitzer, Strasse 27, Karl-Marx-Stadt, Germany.*

A device for applying hydraulic pressure to the top rollers of a drafting frame. A hollow arm 1 is common to the spindle carrying the top rollers of a drafting frame, and a number of pistons 7, 8, 9, 10 and 11, one for each top rollers 2 to 6, of the frame are incorporated in the arm. The arm contains the pressure fluid 13 which acts on all the pistons in unison, one end of the arm is closed by a screw plug 14 and the other end of the arm has a cylinder 15 with a control piston 16, which regulates the working pressure of the fluid. To apply different pressures to each of the top rollers, the pistons associated with each roller have different load areas, each of the pistons having a different diameter on

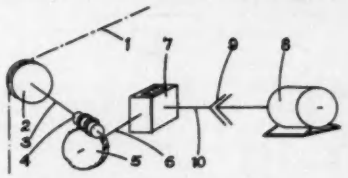


which the fluid acts. The pistons are provided with piston rods 17 which pass through the wall of the arm. The load areas of the pistons may also be varied by using piston rods of different diameters. The distance between the rollers is determined by the degree of attentuation of the sliver that is required. To enable the piston to apply pressure to the rollers the length of the arm is adjustable. The arm consists of a number of individual sleeves 18, 19, 20, 21, 22 equal in number to the number of pistons that are required. The sleeves are screw threaded so that they can be screwed the one into the other and adjustable in length. Alternatively, the arm may consist of a number of telescopic members.

821,449 Metering Device for Winding Frames

VEREINIGTE GLANZSTOFF FABRIKEN A.G., *Wuppertal-Elberfeld, Germany.*

An arrangement on twisting and winding frames for producing bobbins containing a predetermined length of yarn. The yarn 1 is guided over a metering roller 2, which is a roller with protuberances for increasing the friction, and rotates a worm 4 of a self-locking worm gear via a shaft 3. The worm wheel 5 is connected via a shaft 6 to a meter 7. The meter is driven by a motor 8 through a shaft 10 and a slipping clutch 9 which, because of its uniform torque to all



speeds enables the meter to be driven at any desired speed. Since rotation of the worm depends on the speed at which the yarn travels over the metering roller the speed of the meter is controlled by the travelling yarn, without it being necessary for the yarn to use any force for driving the meter.

821,702 Pile Fabrics and Machine for same

VEB TEXTIMAPROJEKT, *Karl-Marx-Stadt* 1, *Elsasser Strasse* 2, *Germany.*

A method of producing plush-like goods, such as carpets, etc., which consists in feeding only two separate and spaced foundation fabrics to a multiple needle sewing machine whose needles pierce both foundation fabrics simultaneously to insert pile threads between, locking the heads of the pile threads at the back of the foundation fabrics and subsequently cutting the pile thread between the foundation fabrics. The pile threads may be locked in any suitable manner.

822,291 Cotton Combers

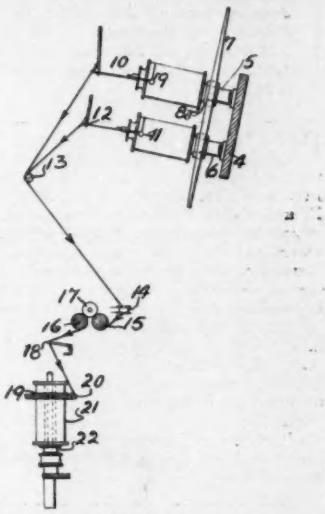
W. E. MORTON AND T.M.M. (RESEARCH) LTD., *Holcombe Road, Helmshore, Rossendale.*

A rectilinear combing machine in which means are provided by which the draft imposed by the detaching rollers on the combed fringe of the lap is constant during the whole of the period between engagement of the foremost tips of the fringe fibres by the detaching rollers and the moment when the distance between the detaching rollers and the nippers has decreased to within a predetermined angle of the cylinder shaft revolution of its minimum value. A constant ratio draft is obtained through a cam, driven by or geared to the comber cylinder shaft and a driving gear train actuating the detaching roller shaft of the comber.

822,333 Cabling Machines

JOHN BRIGHT AND BROTHERS LTD., *Fieldhouse Mills, Rochdale.*

Machine for the manufacture of cords or the like by cabling or doubling. The machine has an inclined member 4 on which are mounted supply bobbin spindles 5 and 6 in rows extending the length of the machine, which spindles are rotated by an endless belt 7 engaging pulleys 8 on the spindles. In order to avoid fouling of the yarn drawn off from the top and bottom spindles, the yarn from the top spindle is drawn through a flyer 9 and a guide eye 10, and the yarn from spindle 6 through a flyer 11 and eye 12. From the guide eyes, the yarn is passed over a rod 13 and the two ends of yarn are then taken together through a guide eye 14, before they are passed through bottom rollers 15 and 16



and a top roller 17. The ends pass under roller 15, over roller 17 and under roller 16 through a guide eye 18 to the traveller of a ring 19 mounted in a ring rail 20 which lays the yarn, twisting or cabling it into one strand on the bobbin 21 on the spindle 22 driven by an endless band. The yarn ends are individually given a certain degree of twist by the flyers 9 and 11 as they are drawn off the packages on the spindles. The twist is arrested at the rollers 15, 16 and 17 after passing guide eye 14 and further twist which cannot run back past the rollers is then put on to the two ends to twist or cable them into a single strand.

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